Q. Air pressure?

A. Yes, sir.

Q. What do you mean by air pressure? Without any water in it?

A. Yes, sir; we turn all the water out and then turn the air in it to expand the boiler as much as one hundred pounds of air will do, in order to locate the broken bolts.

Q. Were these flexible stay-bolts?

A. Which ones?

Q. The ones in this boiler.

A. It had some flexible in it and some rigid.

Q. Were there any caps on them?

A. Yes, sir.

Q. Was any different method of inspection pursued with reference to the caps and those that did not have caps?

A. Yes, sir; those with caps on, we removed the caps and go inside and hit the bolts.

Q. How often.

A. That is done; we remove the caps every annual inspection and as much often as it seems to be necessary. If we have
[506] any doubt of any of them being broken, or show any leaks or anything, we take the caps off.

RE-EXAMINATION.

By Mr. Hall:

Q. Were those bolts in any part of the crown-sheet here that he has been asking you about?

A. That had four rows of flexible bolts.

Q. Did any of them fail in this explosion?

A. Yes, sir; they pulled off the same as others; the four front rows were flexible bolts.

Q. You mean the four front rows?

A. Yes, sir.

(Witness stands aside.)

[507] H. T. NEECE, RECALLED.

H. T. Neece, recalled, for defendant:

Further cross-examination by Mr. Hunt:

Q. I now desire to read from page 103 of your record, Mr. Hall, as follows—or first I will ask a question. Didn't you make this

answer to the question which was asked you about your cross-examination, didn't you say as follows: "We had had so much trouble with fellows claiming we had burned engines around there, that was the reason I done that"?

A. Yes, sir.

Q. You stated that, didn't you?

A. Yes, sir; that is what I stated.

RE-EXAMINATION.

By Mr. Hall:

Q. The question and answer are as follows:

"Q. The purpose of that was to have a light to look at the fire box with, was it not?"

"A. Yes, sir; we had had so much trouble with fellows claiming we had burned the engines around there, that was the reason I done that."

Was that your answer?

A. Yes, sir.

Q. Now, I want to read to you a portion of your testimony in connection with the answer that was read to you a few minutes ago, and ask you if that was not the way you testified at the former trial:

"By Mr. Hall:

"Q. You lighted it, did you?

"A. Yes, sir.

"Q. The purpose of that was to have a light to look at the fire box with, was it not?

"A. Yes, sir; we had had so much trouble with fellows claiming we had burned engines around there, that was the reason I done that.

"Q. Take the witness.

"Cross-Examination:

"Q. The complaints around there about your burning engines were so numerous that you thought you would fix yourself on this particular occasion with a lighted torch, is that true?

"A. Well, this thing had happened with an engine that a fellow claimed had been burned there once before, I reckon a year before that.

"Q. Didn't you just say, 'We had had so much trouble around there, of fellows claiming we had burned engines,' is the reason you did it?

"A. That is what I said."

Is that your testimony?

A. Yes, sir.

[507] (Witness stands aside.)

Court adjourn until tomorrow morning, Friday, October the 9th, 9 a. m.

FRIDAY, OCTOBER 9, 1914, 9. A. M.—MORNING SESSION.

Continuation of evidence on behalf of Defendant.

[508] F. T. SLAYTON.

F. T. Slayton, sworn, for defendant:

DIRECT EXAMINATION.

By Mr. Hall:

Q. Mr. Slayton, what is your position with the Virginian Railway Company?

A. Superintendent of motive power.

Q. How long have you had that position?

A. Since December the 9th, 1910.

Q. As superintendent of motive power of the railroad, what are your duties—what part of the work of the company do you have under your charge?

A. I have charge of the mechanical department, the locomotives, cars and machinery.

Q. Before taking that position with the Virginian Railway Company, what experience did you have in connection with boilers and locomotive engines?

A. I began work in the shops in the winter of 1880 to 1881 on the Canadian Pacific, and from there to road service as a fireman, then as a hostler, and then ran a locomotive for between eight and nine years; was then made traveling engineer or what is known here as road foreman of engines, and from that to trainmaster, train supervisor, superintendent, then division master mechanic, then from that to master mechanic of the entire road for nine years, and then superintendent for about a year before I came to this road.

Q. In those various positions, were your duties such as

[509] to make you familiar with locomotive boilers and engines and crown-sheets and their appliances, etc.?

A. Yes, sir.

Q. Please mention some of the principal railroads that you have been employed by as master mechanic and road foreman of engines and positions of that kind?

A. I have been road foreman of engines and master mechanic, train master and train supervisor on the Chicago & Great Western I was master mechanic and superintendent for ten years on the St. Joseph & Grand Island, and have been here about four years as superintendent of motive power.

Q. Have you had actual shop experience in the working of boilers and building of crown-sheets and repairing boilers and engines, etc.?

A. Yes, sir.

Q. Were you superintendent of motive power when these engines, of which No. 469 was one, were designed and built?

A. Yes, sir; I made the specifications for them.

Q. I wish you would tell the jury what factor of safety you provided for in the crown-sheet of this engine?

A. The crown-sheet was not specified, but a factor of safety was specified on the boiler as a whole, that means that the weakest point in the boiler must have that factor of safety; the boilers were calculated to carry two hundred pounds of steam pressure and have a factor of safety of at least two and one-half. In service we use only a hundred and eighty-five, and the weakest point of that
[510] boiler is supposed to stand two and a half times two hundred pounds pressure.

Q. How many pounds would that be?

A. That would be five hundred pounds pressure to the square inch, without failure, that is, the weakest point in the boiler.

Q. Is that within the requirements of the Interstate Commerce Commission?

A. Yes, sir. At that time the Interstate Commerce Commission had not issued instructions governing those matters, but since that time the Interstate Commerce Commission's rulings have come into effect, and they accept boilers already built with a factor of safety of three—

Q. I wish you would tell the jury according to the construction of this crown-sheet and the tests that were made of the material that went into it, what factor of safety the crown-sheet had?

A. The crown-sheet is probably the strongest part of the boiler, it has a factor of safety in this case of something over thirteen, about

thirteen and three-tenths, that is the crown-sheet would require thirteen and three-tenths times the boiler pressure to force it down.

Q. In connection with these tests that were made of the materials that went into the crown-sheet and the stay-bolts by the Baldwin Locomotive Works, the shop number of the Baldwin
[511] Locomotive Works was what, I do not remember what it was, can you identify that number as being the one that went into engine 469?

A. Yes, sir.

By Mr. Staples:

How do you identify it?

Witness:

The Baldwin shop number—

Q. What is that number?

A. 1246-114-E-28.

Q. You have heard that number stated, how do you identify that number as going into 469?

A. The material, or the records of tests of material show the shop number of the engine, that is their description of it, and then they add on that the builder's number, which is also the boiler number which we report to the Government under report showing the construction of that boiler. The Government requires us now to furnish a sheet showing the boiler number of the engine as designated by the builder, it shows also all the principal parts of that boiler, to allow them to check up our figures as to the factor of safety in the boiler, to which we attach blue prints showing the construction of the seams of the different parts of the boiler; it is also a record of the thickness of the plates as well as the tensile strength of the material
[512] of each sheet that goes into the boiler.

Q. And those numbers correspond to 469 or with the serial number in the Baldwin Locomotive Works records?

A. Yes, sir.

By the Court:

That is the point you said you would connect between the serial number and the actual number?

By Mr. Hall:

Yes, sir.

Q. Mr. Slayton, I wish you would tell the jury whether or not

this engine as it was designed and built is of such strength to make a good safe engine?

A. Yes, sir; and it was so accepted by the Government.

Mr. Hall, continuing direct examination:

Q. According to its design and construction, I wish you would tell the jury what kind of an engine this was as compared with the best grade of locomotives that were being built at the time it was built?

A. We do not know how to build them any better.

[513] Q. What did it cost?

A. This lot cost us approximately $27,000.00 each.

Q. What company built it?

A. The Baldwin Locomotive Works.

Q. How does that company stand as engine builders?

A. They are one of the oldest locomotive builders in the United States, they build locomotives for practically all countries in the world, and they build probably more than half of the engines that are built in the United States today.

Q. What is the reputation of that company as engine builders?

A. Excellent.

[514] Q. When was this engine built and put into service?

A. I will have to refer to my records on that.

Q. Please do so, and just state when it was delivered to you and put in service.

A. The records show that the engine was built in April, 1912, the engines were delivered to us in May and June.

Q. Have you got the dates when this particular engine, No. 469, was delivered?

A. I haven't the date when that one was delivered.

Q. Was it sometime in the month of May or June, 1912?

A. Yes, sir.

Q. What engineman took charge of the engine, or was assigned to that engine and ran it regularly from the time it went into service until the explosion?

A. I met the engines at Sewall's Point and came over the first and second division with this particular engine, as well as with others. On arrival at Roanoke, Engineer Andrews was there, just happened to be the man to catch this engine, and I gave him that engine, assigned him to that engine at that time, and I came with him on that trip from Roanoke to Princeton.

Q. Was that the first time the engine had been run?

A. The engine had been run from the works to Sewall's Point, and then over the first and second division.

Q. And was it run from Roanoke to Princeton carrying [515] a train?

A. Yes, sir.

Q. And he took charge of it?

A. Yes, sir.

Q. Did he continue to have that engine as his regular engine from that time on until the explosion?

A. Yes, sir.

Q. Did you ride with him on the engine on that first trip and on any subsequent trips?

A. Yes, sir; I rode over the road, the whole distance of the division with him, on the first trip, also on the trip just a little while before the accident, about—I have a record in my pocket of that.

Q. I do not think it is necessary to fix the date exactly, but you say it was just a short time before the accident?

A. Yes, sir.

Q. Did he make any statement to you in reference to this engine?

A. The first night that I met him at Roanoke he did not want to take the engine; he was very much pleased with the one he had, and he wanted to have enough of these to equip the division, but he did not want to take this engine on account of thinking it was too large an engine, but before we had gotten one-third of the way over the road he asked me to give him the engine instead of an M. B. which was a smaller size, and on the last trip that I rode with him he had [516] nothing but praise for the engine; he said it was the best he had ever run.

Q. Did you run on these engines enough and on this engine enough to know yourself from your experience as an engineer and in shop work, whether or not it was a good engine and perfect in all of its appliances in operation?

A. It certainly was a good engine in every respect.

Q. What inspections are required of those engines?

A. You mean by the shop employees or by the road men or both?

Q. I mean what inspection does the Government require?

A. After filing the sheet with the Government showing the construction of the locomotive, as I have described, we are required to wash the boiler at least every thirty days and make a stay-bolt inspection every thirty days, which consists of striking each stay-bolt in the

entire boiler with a hammer to determine whether or not they are broken. We are required also to have each stay-bolt that is not longer than eight inches drilled three-sixteenths of an inch, inch and a quarter deep, from the upper end extending into the water leg of the boiler, because those bolts are more liable than any others in the boiler to break in service, and if they break they always fail near the outer sheet, and should one break they immediately leak the size of that three-sixteenths hole out to the atmosphere.

Q. Were those bolts that are most liable to break the ones that were broken in this explosion?

A. Those are not required to be drilled; no, I have never known one to break, these long bolts. That was every month, that that was required. Every three months we are required to make a
[517] thorough inspection, a hydrahaulic test, and put a test on the boiler and test the pops and all appliances. Then every three years we are required to take all the flues out of the boiler or sufficient to enter the boiler and examine it all the way around, examine all the braces and examine all the seams.

Q. That is a three-year inspection?

A. Yes, sir.

Q. This engine had not been in service long enough to go through with that inspection, had it?

A. No, sir; the first sheet filed answered that inspection.

Q. And had it been inspected in these monthly inspections ever since it had been in operation?

A. Yes, sir; there was a report sent in every month to the Government of those monthly inspections.

Q. Rules of the company requiring an engineer to inspect were introduced in evidence. Now, does an engineer who runs an engine look after the inspection between the monthly inspections?

A. Yes, sir.

Q. Is that his duty?

A. Yes, sir.

Q. Is anybody else required to inspect it between those monthly inspections?

A. Yes, sir; we have men at each terminal who are required every time a boiler is washed, it doesn't matter whether it is
[518] at the time the Government requires them or not, we wash them oftener in service to see that the guage cocks, water glass mountings are open, try them and see that they shut off tightly and that they open.

Q. That is when the boilers are washed out?

A. Yes, sir.

Q. How about the crown-sheet inspection, is anybody else required to inspect that except the engineer between these monthly inspections?

A. The boilermaker inspectors at the roundhouse, that is their duty to inspect at all times, they do not go in every trip because the fire is not out; the men in charge of handling the engines at terminals are required to inspect.

Q. Are any rules in print requiring those inspections?

A. They do not deal with all of the inspections. Our rules in print require the engineer to make a thorough inspection of his engine before, during and after each trip and report all defects found.

Q. Is it the custom of engineers to make those inspections before and after each trip?

Q. Yes, sir.

[519] (Manuscript pages 519 to 522, inclusive, marked out.)

[523] Q. In other words, my question is, was anybody required to inspect this engine between that time and the time of the explosion?

A. Yes, sir.

By Mr. Hunt:

If there is any record to that effect and Mr. Slayton speaks from the record and not from personal knowledge of the inspection, it is manifest that the record ought to be produced.

By the Court:

Don't refer to any rule of your company.

By Mr. Hall:

I am not doing that, I am just asking the facts.

Q. Who had to make that inspection?

A. The engineer, as I have said, is required to inspect the engine each trip.

Q. Now, something was said here about engine 473, was this in the same order of engines that were delivered along with 469?

A. No, sir.

Q. When was 473 delivered?

A. Engine 472 to 479 were built in December, 1912, and they were delivered the latter part of December, I believe, and the fore part of January.

Q. You heard what was said here about the crown-sheet of 473 being scorched. I wish you would state how long 473 had been in service when that developed?

A. She had, I believe, made one or two trips over the [524] road, over that division.

Q. What was the nature of the burn or scorch on engine 473?

A. The engine was reported as having a scorched spot on her crown-sheet. I went over to examine it and found that on the right hand side, towards the back, that is, towards the fire box end of the engine, there was a spot, oh, probably as large as my hand or a little bit larger, where there had been an accumulation of borings and drill cuttings, and evidently white lead that was used in lubricating the taps, which cut the stay-bolt holes, or the drill, and that had lodged on that crown-sheet in that spot, and that being thick enough to keep the water away from the sheet, the sheet had been overheated.

Q. How was the scorched place shown, what evidence was there there of it?

A. The sheet inside the fire box had turned a blue color and the soot wasn't appearing thereon.

Q. On the fire box side?

A. Yes, sir; and there was a slight pocketing between the stay-bolt heads.

Q. Was there any leaks?

A. Yes, sir; that is how it was discovered.

Q. If there had been any filings or whatever you found on the crown-sheet of 473, on the crown-sheet of 469, would that have been there at a time when it could have caused the explosion when the crown-sheet blew down.

A. No, sir; it could not have been.

[525] Q. Why?

A. The engine had been in service so long and the boiler had been washed repeatedly. No. 473 had never been washed since the engine had been received; it had not been in service long enough to require a washing.

By Mr. Hunt:

Did you ever see the boiler of 469 washed?

Witness:

I don't know that I have seen that particular one washed.

By Mr. Hunt:

Well, please do not testify to it if you never saw it.

Q. Do you know how often every boiler of every engine that you have got under you is washed?

A. They are washed about every ten days and a record kept of it.

Q. My question wasn't about your record, whether you kept any record or not. My question is simply this, as to whether or not under the requirements of your company that the boiler of every locomotive in service had to be washed at intervals of ten days?

By Mr. Hunt:

We have no objection to that.

[526] A. The requirements are not every ten days; the requirements are every thirty days and oftener if the conditions make it necessary.

Q. In actual practice, how often are the boilers of the engines in the same class of service that 469 was, actually washed?

A. Every ten days.

Q. Something has been said about blowing up steam on this engine 469 on a trip made on it by Engineer Massie. Does the fact that the steam had to be blown up on that engine indicate—

By Mr. Hunt:

We object to that.

Q. I will put the question this way, then: Does the blowing up of steam on that engine show that there was any defect with the crown-sheet at all?

A. It has no bearing in that direction at all.

Q. What does it indicate?

A. It indicates one of several things: we might have had a poor tank of coal on that particular trip; we did have a new fireman.

Q. Who was the fireman?

A. His name was Carr.

Q. Was he an experienced fireman at that time?

A. No, sir.

Q. Does it often happen in the operation of engines that when the fireman is inexperienced that he is not able to keep up the fire, so as to keep up steam?

A. It does; he has to learn to do the work.

[527] Q. I wish you would describe to the jury just in a general way where this particular crown-sheet that was blown down is located, and what the construction of the fire box and the boiler of the engine is at that point?

A. Wouldn't it be quicker and better to refer to the print showing the blue print of the boiler?

Q. Can you do it better on a blackboard or by a blue print?

A. I think I can do it better with a blue print; I am not much of a draftsman.

Q. Very well, do it with a blue print then.

A. This is not a large section, but I presume the jury can see it better here.

By the Court:

That is the blue print of this boiler?

Witness:

Yes, sir.

A. These heavy lines here show the outside one, show the outline of the outer shell of the boiler; this represents the end of the boiler, there is the door hole through which the fireman throws his coal, the grates are located from there to here. This is of course a comparatively small scale, the cab extends up like that and back over that way; there is where the engine crew is located, the engineer on the right side, the fireman on the left; this shows as if the boiler was cut through the middle, just split through.

[528] Q. I will ask you if that blue print shows correctly the section of that engine and shows the crown-sheet and fire box of the engine?

A. Yes, sir; it is gotten out by the Baldwin Locomotive Works who built the engine.

Q. All I want to know is whether it correctly shows the section of the boiler, about the parts there that I have asked you?

A. Yes, sir; it does.

Q. Now, just go ahead and point out where the fire box is located and where the crown-sheet is located?

A. This is the boiler head in the cab, extending up here; this is the top of the boiler shell which has been spoken of as the wagon top; this is the barrel of the boiler or dome sheet; this is the dome located up here; this sheet goes down from the dome sheet to the smallest part of the boiler or the barrel as it is called; this is the front flue sheet where the flues end, and from here to that point is the smoke box where the gases pass out into the stack.

Q. We are not interested in the smoke stack.

A. This is the forward end of the boiler proper; that is the

lowest side of the boiler.

Q. Where are the flues located?

A. Let's get the fire box located first. This is the mud ring, as we call it, the foundation ring, that makes a space between these two sheets and those two, and the other sheet along the side; that is the fire box in the opposite part of the boiler. Now, the fire
[529] box proper is obscured by this part here from the mud ring at that point up here to the door hole where it is flanged out here, and here, and it extends on to this crown-sheet; this is the flue-sheet, the flues now extend from this sheet here to the forward flue-sheet; there are 270 two and a quarter inch flues in this particular boiler, nineteen feet long; it is nineteen feet from there to here, and there are forty-five and a half inch tubes in there also, which are used for the superheating of steam. This shows the front and back legs of the boiler, the sides are smaller, the idea being to have water surrounding the fire on all sides. This sheet is not exposed to the fire at any point without water on the opposite side of the sheet.

Q. That sheet above, running right across there, I wish you would state whether that is the particular sheet that failed in this engine?

A. Yes, sir; that sheet in this engine, in this lot of engines, is the one that extends from the mud ring on the one side up over the roof of the boiler and over to the mud ring on the other side; there is no seams in that sheet itself; it is, of course, riveted there and here to the front or back of the flue-sheet of the boiler and the door-sheet.

Q. How large is the opening there at the door?

[530] A. It is 11 by 22, that is, 11 inches high and 22 inches wide.

Q. How high is it above the platform in front of it on which the fireman stands when he throws coal into it?

A. You measure from there to there and it is about 36 inches; the deck is, that the fireman stands on, is located about there; it is about 22 inches from the deck up to the lower part of the fire box door.

Q. Where is the brick arch located?

A. The brick arch is located at this end just below the lower flue, so as not to interfere with the draft through the flue, then it extends up at an angle like that ,and clear across the fire box.

Q. Just take your pencil and draw a line there indicating the location of it and how it extends back there?

A. I have a drawing over there that will show it better.

Q. Just put it on this.

A. (Witness does so.) Something like that. This is a series of brick about four or five inches thick that are supported on arch tubes that extend through this sheet here, and this one up here, and they rest on these arch tubes.

Q. Is this brick arch from that point down to here solid?

A. It is made up so that the bricks fit together and there are certain sections of brick that rest on the tube; we can take out one section at a time, but it covers it solid, the whole place, but it covers it solid, the whole place, except the little opening between
[531] the brick here and the flue-sheet, to allow any cinders that might accumulate on there to fall through. The fire is on the grate from there to there, which is 9 feet 6 inches, and the width of the grates is six feet.

Q. Now, Mr. Slayton, how much of a slope is there in this crown-sheet from this point back to this point?

A. Four and three-eighths inches, that is, when the engine is level; this sheet here, this end of the sheet is four and three-eighths inches higher than the sheet there (indicating).

Q. When the water gets low in one of these engines, would that part of the crown-sheet be the first that is uncovered?

A. The first to be exposed would be right there (indicating).

Q. And as the water goes down does it get off the rest of it?

A. It extends further down this way (indicating).

Q. What part of this crown-sheet that is here was actually blown down?

A. That row of holes, the small holes next to the post there, are the rivet holes that connect that sheet, which is this sheet here, to this flanged flue-sheet, and it extends back something like to there (indicating).

Q. Back to the line you have marked?

[532] A. Yes, sir.

Q. Have you got another blue print that shows the actual position that was forced into?

A. Yes, sir.

Q. I wish you would get that and point it out on it.

(Witness does so.)

Q. Does the blue print which I hold in my hands marked "Section through Fire Box", show the crown-sheet in the same position that the large blue print does that we have just been talking about?

A. Yes, sir.

Q. How have you indicated on the blue print marked "Section

through Fire Box", the position that the crown-sheet was in when it blew down by the explosion?

A. By a dotted line.

Q. Was the part of this crown-sheet from where these dotted lines run into the sheet, from there on down to the lowest point of the sheet, was that injured at all in this explosion?

A. It wasn't injured, it was heated a little further but not sufficiently to weaken it, to allow it to come down.

Q. Were any of the stay-bolts broken in that part down there?

A. No, sir; none back here.

Q. Now, the brick arch in there, as you have indicated it on that blue print, which we will refer to as being marked "3-D", what position would a man have to get into in order to see the crown-sheet through the door?

A. He would have to get down so that his line of vision [533] would pass the corner of that arch, to see up here he would have to get down below the top edge of the door, pass the upper corner of the arch to see the sheet.

Q. He couldn't see the crown-sheet at all through the brick arch?

A. No, sir.

Q. In the blue print marked "Section through Fire Box", which I have just shown you, is there indicated another section of the crown-sheet showing a number of stay-bolts that failed in this explosion?

A. Yes, sir.

Q. How are they shown on that blue print?

A. The ones which broke off at the time the sheet came down are shown in solid white dots, those which remained, that is, the button stay-bolts which remained and were not broken off entirely, and those not damaged at all, are just described by a circle, the same size as the dot.

Q. I will ask you to identify the blue print marked "3-D" as Exhibit A, and the blue print marked "Section through Fire Box" as Exhibit B, and file them with your answer.

A. I will here file them as requested.

Q. I hand you another blue print which I will ask the stenographer to designate as Exhibit C, and ask you whether or not [534] that shows a section of this boiler over the fire box?

By Mr. Hunt:

Your Honor will allow us just to save a general exception to the

introduction of these blue prints upon the ground that they have not been authenticated.

By the Court:

I think they ought to be authenticated.

By Mr. Hall:

That is what I am doing now. I am proving by this witness that they correctly show the construction of the boiler and that is an authentication of them.

By Mr. Hunt:

I would like to ask a question as a basis of objection. Have you checked the construction of this engine and each part with that blue print that you have before you?

Witness:

Each part?

By Mr. Hunt:

Yes, sir.

Witness:

No, sir; not each part of the entire engine.

By Mr. Hunt:

Of the fire box?

Witness:

Yes, sir.

By Mr. Hunt:

You have?

Witness:

Yes, sir.

By the Court:

This is nothing but a survey and if a survey is to be authenticated it must be authenticated by the party who made the survey or some one who has checked the survey. If he has checked those parts there about which he has been asked, that is a verification of those parts.

Exceptions.

Q. Now, please read the question.

(Question is here read to the witness.)

A. This one shows a cross section cut through the fire box in

this way (indicating); this shows the outer shell of the boiler, and this the fire box sheet. This is the position normally; this
[535] is the position from there to there, shown in the dotted lines where the sheet was after the accident.

Q. So then, if I understand you, the red line at the top of it shows the normal position of the sheet?

A. The top of the red line.

Q. And the dotted line shows the position the sheet took after the explosion?

A. Yes, sir.

Q. Now, when did you first see this engine after the failure?

A. The next morning.

Q. Did you make any examination of it, or were you present when any examination of it was made?

A. I made no examination until the two Government inspectors arrived.

Q. What did you have done with the fire box of this engine until they did arrive?

A. As soon as I heard of the accident, I sent our road foreman of engines, Mr. Houston, to accompany the engine to Princeton, with instructions not to allow anybody to disturb anything about the engine.

Q. When it got to Princeton, what did you do with it?

A. When it got to Princeton the openings in the cab were fastened up with canvas that night to prevent any one getting in. The next morning we removed the canvas and applied—

By Mr. Hunt:

(Interposing.) Were you up there when that was done?

Witness:

Yes, sir.

By Mr. Hunt:

When the canvas was put on?

Witness:

Yes, sir; that evening.

[536] Q. Now finish your answer.

A. And applied boards back of the cab to make it more secure.

Q. When this inspection was made who was present?

A. Mr. Lewis, my assistant; Mr. Bowden, our chief boiler-

maker, or foreman boilermaker; Mr. Houston, the road foreman of engines; and I do not recall any others at the time we were making the inspection of the boiler, except the two Government inspectors.

Q. When this engine failed did you notify the chief boiler inspector of the United States Government?

A. At Washington?

Q. Yes, sir.

A. Yes, sir; by wire.

Q. Did he send those two boiler inspectors there to make this inspection of the engine to determine what was the cause of the failure?

A. Yes, sir; we are required by law to notify them, if there is any personal injury.

Q. And they were sent there pursuant to that notice?

A. Yes, sir.

Q. When you went into that fire box, what did you find [537] as to the condition of the crown-sheet?

A. The crown-sheet was bagged down as indicated by the dotted lines on the blue print submitted. The bolt heads, or quite a number of the bolt heads, were found laying on the grates in the fire box and in the ash pan. The grates were blown down into the ash pan, and the supports for the grates were broken. The ash pan was blown down from its support at the mud ring, until it rested on the engine frame; the brick arch was blown down, there was a few bricks remaining up.

Q. Are these the bolt heads that were produced at the trial of this case in the Federal Court at Roanoke, and produced here, numbered from one to twelve, the bolt heads that were picked up in the fire box and on the platform of that engine at the time the inspection was made of it?

A. There are some there that were not shown at the Federal Court, but they were all picked up in the fire box at that time.

Q. How many of these twelve bolt heads were shown in the trial in the Federal Court?

A. Nine.

Q. Where were the other three then?

A. At that time?

Q. Yes.

A. They were in the pigeon hole in my desk, in my office.

Q. Have you had those three ever since the explosion, [538] in your desk?

A. Ever since that morning after the explosion occurred:

yes, sir.

Q. Is that the crown-sheet that is produced here that was taken out of the engine?

A. That is a part of the crown-sheet that was in the engine; yes, sir.

Q. Is that the part that was forced down or buckled, as we call it, as shown by the blue print, the dotted lines on the blue print, which you have introduced in evidence?

A. Of course, it extends a little further than the pocketing there; it includes all the pocketed area and a little that is not, that is, the two corners there that are not pocketed.

Q. When you went into that engine to make that inspection, what were the indications there to show, if any, that it had been blown down without any water on top of it?

A. From the fire box side there was first the color, which was very distinctive, the absence of soot on the part that had been hot, the form the sheet was in, between the stay-bolts' support, the opening of the seam between the crown-sheet and where it is riveted to the flue-sheet, which is the first indication I looked for in a scorched sheet.

Q. That is on the bottom side?

A. The bottom side of the crown-sheet.

Q. Next to the fire box?

[539] A. Then the flues indicated down on the first row of flues that they had been heated, the line across the flue-sheet showed the color that the crown-sheet had where it had been overheated.

Q. Was the flue-sheet bent down?

A. Yes, sir.

Q. Now, take the color first. If that crown-sheet had failed with water on top of it, what color would it have been?

A. It would be the same color as the rest of the fire box, which is a black sooty color, and it would be coated with soot as they always are.

Q. Would it present a blue color which is shown in the present case?

A. No, sir.

Q. How about the soot on it if it failed with water on top of it, even though it had been previously burned?

A. Soot is carbon, and carbon will burn on hot iron, it will not burn at the temperature it is when it adheres to the sheet, that is, in contact with water on the opposite side, and for that reason when a

sheet is heated to a red heat it burns the carbon soot off the sheet.

Q. Does the bottom side of that sheet now show the soot on the parts of it that were not burned?

A. Yes, sir; it shows some. Of course, it had been handled a great deal in getting it out, and some has rubbed off but still it shows.

Q. Now, what conditions did you find on the top part of
[540] the sheet that indicated it had no water on it at the time it went down?

A. After removing the auxilliary dome, which is located in the dome sheet of the boiler just ahead of the fire box, we went down in on top of the flues and you could get right up to the crown-sheet and there all of the stay-bolts which are located four inches apart were exposed, extending from the roof of the sheet or outside of the sheet of the boiler down to a point right to the holes they were originally in, and they were all broken off at the lower end, the heads had pulled off.

Q. Just as these show here?

A. Yes, the ends of the bolts were the same color of the head, that is at the end, then the heat extended, or the color extended, and blended from a bluish condition at the lower end up above the distance on the bolts, those parts, the head end of the crown-sheet was the highest point, the coloring extended up probably an inch and a half or two inches, though further back it was shorter and it of course blended out to where there was no discoloration, because it had not been hot enough, the coating of the lime still remaining on the bolts.

Q. How about the line of coloring on the sheet itself on the top side?

A. The sheet, well, there was no coating of lime, the engine had not been in service long enough to get anything like a heavy coating
of lime. There was a very light coating of lime that ap-
[541] peared on the top of the sheet and extended a little along on the side, a little beyond where the last row of heads pulled off, it extended down to the next row of stays almost along the line of the other row of stays on the other side, and back at the rear the coloring extended about three to four rows back, to the furthest bolt that pulled off, that is, there was some coloring but that blended off also.

Q. Was that line of demarcation between where the water was on the sheet and where it was off, clear and unmistakable at that time?

A. Yes, sir; perfectly clear.

Q. Can it be seen now?

A. Yes, sir; it can be seen yet, though not to so great an extent.

Of course, you cannot see how far it extended back on account of its not having been necessary to cut the sheet back that far, it had not been hot enough to distort the sheet to justify our cutting off more of the sheet.

Q. Taking these bolt heads, Mr. Slayton, that were picked up there at the time, what does the contour of the top side of these bolt heads indicate with reference to whether they were hot or cold at the time the sheet was put in that condition? I mean at the time the explosion occurred?

A. They show unmistakably that they were hot when
[542] they were formed that way, considering the fact that they were only in contact with a thin sheet.

Q. How is the top surface of these bolt heads shaped in a normal position before they have been distorted and forced out of shape?

A. The face of the head is at right angles to the length of the bolt, the center line of the bolt turns in a lathe that way (indicating), it couldn't be otherwise.

Q. Mr. Slayton, can you force a bolt head in that shape cold with a three-eighths of an inch sheet like that over it?

A. No, sir.

Q. Why not?

A. Because the sheet is not strong enough to do it.

Q. Which is the harder metal, the sheet or the bolt?

A. The sheet is tough steel the bolt is soft iron, made soft so that it will rivet over. Iron is softer than steel, that is, when cold, of course.

Q. When these bolt heads were forced in that position, did the sheet surrounding these bolt heads have the same shape or was it bagged between the bolt head in the same shape that these bolt heads are?

A. It must have been, there was nothing else to put them in that shape.

Q. Was that bagging greater before the sheet broke loose and was forced down than it was before the bolt heads broke loose and while they were put in that shape?

A. I didn't get that question just right.

[543] Q. The question is this, was the sheet bagged between the bolt heads so as to force the bolt heads in the position before the bolt heads were broken off?

A. It must have been.

Q. Before they were broken off, was the bagging of the sheet

greater between the bolt heads than it is now, since it has been forced down ten and three-quarter inches out of its normal shape?

A. It must have been bagged much worse than it is now, between the bolt heads, yes, between the bolt heads, to force them in that shape.

Q. What effect would the forcing of that sheet down ten and three-quarter inches from its normal position have on these bags between the bolt heads?

A. It would of course have to stretch the sheet to cover the greater distance, and it would stretch the sheet where it was easiest to stretch, the point of least resistance; of course, it would be easier to stretch the pockets out than to stretch the solid metal.

Q. Have you made, from actual measurements of the shape of these bolt heads, a diagram showing the shape in which that sheet was forced in order to make the bolt heads assume that shape?

A. Yes, sir.

Q. Does this represent a life size diagram of the crown-sheet and the position of the bolt heads and stay-bolts in it?

A. Yes, sir.

Q. I will ask you to identify this drawing as Exhibit D
[544] and file it as a part of your answer.

A. Very well, I will do so.

By the Court:

That is made from actual measurements?

By Mr. Hall:

Yes, sir; actual size.

Q. Does the sheet from this last stay-bolt on the right side of it to the end of the sheet on the left side of it indicate the actual curvature of the sheet when it is in its normal position?

A. Yes, sir; this black line over here, the solid line, and the white, between the two black lines from here to there, show the actual position of the sheet normally, that is, the radius of that crown-sheet is 96 inches, that is, a circle struck from a point 8 feet below, that is, it represents a 16-foot circle.

Q. Do the black lines there indicate how the sheet stands with reference to the button-head bolts and the part that is held by them when the sheet is in its normal position?

A. It does.

Q. What does this red line along the crown-sheet indicate?

A. This represents the present contour and the red indicates

the position the sheet must have been in to bear on the bolts and force it to that position at the time it was put into the position it is now, or the shape it is now.

Q. Could that crown-sheet have forced those bolt heads
[545] into the shape that they are now unless it took the form of the red line there indicated by the diagram?

A. No, sir.

Q. When the crown-sheet was pocketed, as shown by that diagram, was it hot or cold, that is, did it have water on top of it or not?

A. It did not have water in contact with it, that is certain.

Q. What not?

A. Because it could not have been heated that way with water on it.

Q. Can a crown-sheet be heated so as to make it pocket in that way with any degree of heat you can put under it with water on top of it; I mean with any degree of heat in a locomotive?

A. No, sir.

Q. In your experience as a master mechanic, superintendent of motive power, and an engineer, extending over how many years, since 1880?

A. Yes, sir.

Q. Have you ever seen button-head bolts broken off under the head in the way these are broken when the crown-sheet wasn't hot on top?

A. No, sir.

Q. Why is it that they will not break off in the head in that way when there is water on top of the sheet?

A. If there is water on top of the sheet they are prac-
[546] tically in the same condition that they would be cold, that is, they would have the same tensile strength and they are always made larger under the head than they are in the body of the bolt, and I never have witnessed the test or heard of one where a bolt head could be pulled off, it always broke the bolt in the body, that is, out where it was reduced in size.

Q. How much larger are these bolts right at the head than they are in the body of the bolt?

A. The bolt is one and three-sixteenths of an inch at the head before it is threaded, and the bolt out in the body is an inch.

Q. With the threads in it, is the bolt larger right at the head than it is in the body?

A. Yes, sir; at the root of the thread, that is, at the bottom of the thread, the smallest diameter under there is greater than the body

of the bolt.

Q. What does a break in these bolts, that is, down in the head, indicate?

A. That indicates that the bolt was hot.

Q. Why did it break down into the head that way?

A. Because it was hot, the bolt as it extends up into the crown-sheet would convey some of the heat away and the outside of the head of the bolt would be hotter than it was right in the center where the head had contact with other metal to carry it away.

Q. In order to break a bolt that way, assuming that the bolt is cold, that is, has water on top of the crown-sheet, is the area of surface that is to be broken or disrupted greater than the cross section
[547] of the bolt?

A. It certainly is, it breaks down in, of course it is dished out and there is more surface to separate than if broken straight across, normally, if it was cold or in a normal condition, it would break straight across through the smallest section, or the least area.

Q. Have you seen any of these bolts broken at the head in the testing machine?

A. Yes, sir; I have.

Q. When they were cold?

A. Yes, sir; and hot.

Q. How do they break when they are cold?

A. They never break at the head; we couldn't get them to break at the head; they always break in the body; the bolt pulls apart out in the inch section.

Q. Did you fix any of them so they would break at the head?

A. We tried it.

Q. I say, did you try to break any bolts in the head? In other words, did you cut a groove around there?

A. Yes, sir.

Q. When you did that, how did the bolt break?

A. You mean, cut a groove around the head and bolt?

Q. Yes, sir.

A. No, sir; I did not make that test.

Q. You didn't make any test of that sort?

A. No, sir.

Q. How did they break when you pulled them in the
[548] testing machine hot?

A. Some broke just like those and others a little different, depending on the degree of temperature.

Q. When Professor Randolph was on the stand the other day,

he was asked to pick out certain bolts in the lot of bolts that were before him, and he picked out bolts Nos. 2 and 3, and the bolt designated by the figure 9, as being broken in a certain way. I wish you would tell the jury where bolts 2 and 3 came from, indicated by the dots on them.

A. Bolts 2 and 3 were picked out of the fire box of engine 469 after the explosion; that is, the heads were.

Q. Where did bolt head No. 9 come from?

A. No. 9 was found on one of the bolts that came from the crown-sheet of engine 469, was fitted into the sheet the same as the original construction of the engine.

By Mr. Staples:
Was that done by you?

Witness:
Yes, sir; I witnessed it.

Q. Go ahead.

A. And heated—well, first it was screwed into the sheet until the three-quarters of an inch square extension on the bolt head, which is left there for screwing them in, was twisted off, until it twisted that three-quarters of an inch section off; the head was heated to a dull red, the end of the bolt, and pulled in the testing machine until it pulled the head off.

Q. And was the head in that shape and the break in it,
[549] in that shape, when it failed under those conditions?

A. That is just as it came from the testing machine.

Q. You say this was heated to a dull red heat when it was pulled?

A. Yes, sir.

Q. Professor Randolph says that this bolt head, No. 9, looked to him, after a careful examination with a microscope, that it was broken colder than the bolt heads 2 and 3. I wish you would examine the three and see if you can see any difference between them, or have you examined them?

A. I have not compared them in that way.

Q. I wish you would please do so.

A. Now, what is the question?

Q. The question is whether the color of those bolts indicates any difference in the temperature, whether No. 9 was colder, as Professor Randolph says, when it was broken, than 2 or 3?

A. I do not see but very little difference in the color; there is a

little difference in the fracture.

Q. What does the difference in the fracture indicate as to which was the colder when they were broken?

A. I would say that No. 9 shows that it was not as hot as the others; it shows some fiber in the iron, all the fiber has not been destroyed to the extent it is in the other two.

Q. So you agree with the Professor about that?

A. Yes, sir.

Q. But No. 9 was broken at a dull red heat?

A. Yes, sir.

Q. Did you pull any of the other bolt heads or stay-bolts that came out of that engine?

A. Yes, sir.

Q. Just describe how you pulled them.

[550] A. That (indicating) was another head formed on a bolt with the same lot that came from this same crown-sheet, formed in the regular way and made the same size.

Q. What number was that? Are you speaking of No. 9 now?

A. No, sir; I am speaking of No. 7.

Q. Where is that?

A. I don't know; I think it is there.

Q. Is this it?

A. Yes, sir; that is one that was heated to a higher temperature and pulled in the same way; that was screwed in.

Q. This is the figure 7?

A. Yes, sir.

Q. There are no dots on that?

A. No, sir; that is not one of the twelve.

A. That was pulled in the same way after heating, only it was heated to a red heat, not to a clear red well something like a cherry, and pulled until the head pulled off.

Q. And that took that form when it dropped?

A. Yes, sir.

Q. And broke in the head?

A. Yes, sir.

Q. Was the rest of the bolt heated besides the head?

[551] A. No, sir; it was heated just as near the condition we assumed existed in the fire box, as we could get it.

Q. Did you pull any of these other bolts?

A. Yes, I pulled two before anything was done to them at all.

Q. You pulled them cold?

A. Yes, sir.

Q. Where and how did they break?

A. They did not have heads on them, they broke in the body; the idea was to find the quality of the iron and get the tensile strength, reduction of area, and percentage of stretch, etc.

Q. State to the jury about these two bolts that came out of the crown-sheet of this engine, when they were pulled cold?

A. Bolt No. 1 was one inch and six thousandths in diameter, that gave us an area of .795 square inches.

Q. It is not necessary to go into details or figures, just tell us what tensile strength it developed under that test to the square inch.

A. It broke at 40,100 pounds, or 50,440 tensile strength
[552] per square inch.

Q. 50,440 pounds?

A. Yes, sir.

Q. How does that compare, the tensile strength of that bolt, with the original strength of the material, as it was tested when it went into the engine?

A. Right along with it, there was very little difference in the tensile strength of each test.

Q. How about the other bolts that you pulled cold, what tensile strength did it develop?

A. 50,600.

Q. To the square inch?

A. Yes, sir.

Q. Were those the only two you pulled cold?

A. No, sir; these were the only two pulled before we formed them into bolts to test the other part. I then had seven of these same bolts heated up in the usual way in a bolt heating machine, made them the original size that they were when they were put in the engine, except we made the square seven-eighths instead of three-quarters, to enable us to have enough metal there to make another test, which we wanted to determine. I brought one of those bolts just as it came from the forging machine, with the head formed on it, I brought another with the head formed on it, and turned down to the size it is made before the threads were cut.

Q. Where are those bolts?

[553] A. They were locked in the vault here in the Clerk's office.

Q. Please get them.

(Witness here produces said bolt.)

Q. I wish you would pick out the two bolts now and show them to the jury that you pulled cold, and that stood the strain which you

have described?

A. There is bolt No. 1.

Q. And this is bolt No. 2. Now hold it up and show the jury how they pulled and in what shape they were when they broke under the test. Were those two bolts elongated and the size of the bolt reduced at the point of breaking there?

A. Yes, sir.

Q. As shown by these bolts when they broke.

A. One end is gripped in the machine here, the other down here, and it is pulled until it does break, the reduction there shows that this was the weakest point between the two bars where it was gripped and before it is pulled it is laid off here in eight inches, stamped one inch apart, to get the elongation, the stretch in the eight inches. It is caliphered beforehand to get the diameter, and then it is caliphered after the fracture to see how much it is reduced in size before it broke.

Q. How much did it stretch in the eight inches?

A. I haven't that; I didn't make a note of that in my book; I do not think I have the elongation on the top, but I have the tensile strength.

Q. Do you know how much it reduced in area before it [554] broke?

A. Yes, sir; I have on those two; I have it all; reduction in the area, 47.3 per cent on No. 1, 37.9 on No. 2.

Q. You mean that No. 1 became 47.3 per cent smaller in area across here before it actually pulled in two?

A. Yes, sir.

Q. And No. 2 37.9 per cent smaller?

A. Yes, sir.

Q. How much did they stretch?

A. The per cent of elongation was 26.25 per cent on No. 1, and 24.50 per cent on No. 2, that is, a section 8 inches long was stretched to 10.1 inches and 9.96 on the other.

Q. What does that indicate as to the character of the material?

A. It indicates or proves that it comes within the specifications for the stay-bolt iron as specified for the engine.

Q. Does it show that it was a high grade material, or not?

A. Yes, sir; for the purpose.

Q. What was the next test that you made of this material?

A. The testing hot as I have described.

Q. I wish you would pick out the bolt that this was broken from, which is No. 7.

A. There is the plate that it was pulled through in this
[555] test, the bolt was screwed into this sheet, it was threaded and heated the same as this perfect bolt here, screwed into the sheet, the sheet inverted with the bolt now over the fire and heated to this one was a cherry red, or about a cherry red, and then it was put into the machine with this plate resting on a circular opening about ½ inches in diameter, which is gripped in the machine and pulled until it broke, and that broke right under the head.

Q. Was the rest of the bolt heated?

A. No, sir; of course the heat extended up here a little ways on the bolt, but it wasn't heated up here.

Q. You say this was heated to a cherry red?

A. Yes, sir.

Q. Now ,what other test did you make of that material?

A. We described No. 9, this is the bolt and this is the plate that No. 9 was pulled in, and you had the head of the bolt over there; this was pulled in a similar way only it was not so hot.

Q. This is No. 9?

A. Yes, sir.

Q. And that broke under the head?

A. Yes, sir.

Q. I believe 9 was pulled at a dull red heat?

A. Yes, sir.

Q. Did you pull any more of them?

A. Yes, sir; some cold.

Q. What did they do when you pulled them cold?

A. They invariably broke in the body of the bolt.

[556] Q. Just describe how you pulled No. 8.

A. No. 8 was screwed into a three -eighths of an inch plate tight and pulled cold until the bolt broke in the body, it broke at 41,550 pounds tensile strength.

Q. Tensile strength?

A. No, that is what it broke at, the tensile strength was greater because the area is less than an inch, that was the actual breaking point.

Q. This seems to be loose on here and does not screw off, how did that happen?

A. Because the threads are stripped in there.

Q. How were those threads stripped and why were they stripped?

A. By the pull, or the strain on the bolt. This is No. 6.

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Q. Was that pulled cold, No. 6?

A. No. 6 was screwed into the plate with a three-foot wrench until the thread in the sheet was stretched; we left this large square so that we would have enough metal there to enable us to strip this thread in the sheet; I don't know whether the thread in the bolt or the sheet stripped, anyway we turned it until we could turn it right around, the idea being to put as much strain on the head as possible in that way, and then it was pulled in the machine the same way as the others were, and is broke in the body.

Q. In screwing this bolt up until the threads were
[557] stripped, did that injure the bolt in the head as far as the test showed?

A. I have not been able to examine the head, but as far as the test showed it did not, because it broke in the body when it was pulled.

Q. Did you make any other test of this material?

A. I think that covered all the bolts that I took to the testing machine.

Q. You tested two of them cold?

A. Yes, sir; and two hot, and two before we did anything to them, and then I brought two in different stages of manufacture.

Q. Which are those?

A. That one there is just as it came from the forging machine after having had the heat put on it; first, I had to cut off the end of the bolt because it had some threads on it, and then they were all heated far enough up here, in the furnace, to enable the forging machine to force the metal into that shape, that forms a square on here with which to turn them in forms of button-head, and enlarges the bolt at that point to give us material to cut the threads on, to give the area of the size in the sheet.

Q. That just represents one stage of manufacture of a button-head stay-bolt, does it?

A. Yes, sir; and this out here shows a flow of metal as it was squeezed out between the dies in forming that head.

Q. What does this bolt represent?

A. That is the next stage of manufacture in regular prac-
[558] tice for this size bolt, and this head is made three-quarters of an inch, and we had it made seven-eighths, to give us power to strip the threads off in the sheet.

Q. If you made it the size usually made, what would have happened when you tried to strip the threads off?

A. We feared it would twist this off before the bolt took the thread, and we wanted to go to the extreme and strip the thread.

Q. To see whether that would injured the bolt in the head?

A. Yes, sir; they are always three-fourths or seven-eighths and are nicked here in another machine as you see on the corner, to make them easy to break, for in screwing in sometimes they are broken off and sometimes they are left, different roads have different ideas, then it was turned in the machine, the next stage to that shape to enable us to put the threads in, faced off and turned down, to this size, and then it was ready for the thread. This is the bolt when it is threaded, but it is not one of this lot, this is one we have at our works applying to all engines in that place.

Q. This plate and bolt No. 8, I understood you to say was cold?

A. Yes, sir.

Q. When it was pulled cold did it make the bolt head take the shape of these bolt heads that are produced here that came out of the engine?

A. No, sir.

Q. Can you show the jury it did not?

[559] A. We couldn't get it out because the threads are destroyed, but it is easy to see that it has not taken any such form.

Q. Could you hold it up and see that it does not take that shape?

A. We could, of course, drive it out there, but we wanted to show it in the sheet just as it was pulled.

Q. After everybody has looked at it, I wish you would have it driven out or drive it out and show how that head looks after it has been pulled?

A. Well, I will do so.

(Here jury examines said bolt.)

Q. How and where were those tests made?

A. In the laboratory of the Baldwin Locomotive Works at Philadelphia.

Q. And they were pulled in the testing machine as you have described?

A. Yes, sir.

Q. Now, did the material of those bolts all come out of this engine, 469?

A. Yes, sir; out of the bolts removed from the crown-sheet of engine 469.

Q. And was that material in this engine put in there when it was constructed and there at the time of the failure?

A. Yes, sir.

Q. Now, all of these bolts, as I understand you, that were
[560] pulled cold, broke in the body of the bolt?

A. Yes, sir.

Q. That is all that are here?

A. Yes, sir.

Q. And you were only able to break them in the head by heating them to a dark red heat or a cherry red heat?

By Mr. Hunt:

That is not what he said.

By Mr. Hall:

I may have him wrong.

By Mr. Hall:

He says they invariably broke.

Q. What did you say in regard to that?

A. I think Mr. Hunt is right; I said they invariably broke, and in these tests that we made they were heated at the head; we of course did not make a test at all temperatures, but all these that were heated broke at the head and those that were not heated broke in the body of the bolt.

Q. Now, describe to the jury how you made those nuts on the end larger and screwed them in with a big wrench until you twisted the thread, why did you do that?

A. We wanted to see if there was a possibility of abusing the bolt head enough to cause it to crack. We also tapped that hole at an angle through the sheet to let the bolt head bear on one side and then we could stick a feeler through on the other side of the head, that was to see if by letting the heat bear on one side it would tend to double it over and develop a crack.

Q. If the bolts had been screwed in so tight in this engine, I mean in this crown-sheet, I mean when it was built, as to injure the head, what would have happened?

A. It could not injure the head by screwing them in so
[561] tight.

Q. Why?

A. Because it would strip the threads in the sheet or on the bolt. I don't know which is stripped, there is only three-eighths of an inch thickness on the sheet and there is only that much bearing at the time it is tightened up and I suppose the thread on the bolt would have stripped because that is a softer metal.

Q. If it had occurred, what would have happened?

A. It would have leaked on test.

Q. In the ordinary size that these heads are made, how much smaller is the head there where it is nicked than the bolt under the head where the threads begin?

A. You mean square on the head?

Q. Yes, sir.

A. Square on the head of those bolts was three-quarters of an inch, while that under the head is a trifle over an inch of metal.

Q. And how much is the bolt head nicked there?

A. Considerably at the corner. But it is probably reduced to—well, I don't know. but it is not much, the greatest tendency of that, when it tends to punch it out, like cutting it off with a shears, it will reduce it in area.

Q. In actual practice of screwing these bolt heads in there where do they break when you screw them up as tight as you can with a heavy wrench?

[562] A. They would break square off. What we do is to screw them in as tight as we consider we can get them up, and then take a chisel and nick them and breakthem off. Some railroads do not take them off at all, they leave them on there.

Q. Mr. Slayton, you have examined that crown-sheet, I wish you would please state to the jury whether there are any indentations around those bolt heads in the sheet that were made by the bolt head?

A. There certainly are.

Q. Can they be seen all over the burned area?

A. They are very pronounced.

Q. Could those indentations in that sheet have been made by the bolt heads when it was cold, that is, when it had water on top of it?

A. No, sir; the test here indicates that they could not.

Q. Why couldn't they have been made?

A. Because the metal of the plate is really harder than that bolt, because there wasn't strength enough in the body of the bolt to cause it to be pulled into the metal that way; the other indication is that the body of the bolt is the weakest part of the bolt.

Q. How far is that sheet forced or buckled down from its normal shape when it is in the boiler?

[563] A. Ten and three-quarter inches at the greatest point or greatest depth.

Q. How much force would it take on the area of that sheet that is buckled down in that shape to force it down when it is

cold, with water on top of it?

A. To force it down cold?

Q. Yes, sir.

A. It would take—it figures out something over eight hundred tons.

Q. In other words, if I understand you, in order to buckle that sheet down in the shape it is now, when cold, that is, with water on top of it, it would take eight hundred tons to force over the buckled area?

A. More than that, but that is conservative.

Q. How much is the maximum force exerted on that area under a steam pressure of 185 pounds?

A. 233.8 tons, that is, with 185 pounds pressure to the square inch, taking in the whole area represented by the bolts that have their heads broken off. It would take 467,680 pounds or 233.8 tons.

Q. Is that the maximum force that you can get there by an explosion or otherwise with 185 pounds of pressure?

A. Yes, sir.

Q. And the sheet cold would take over three times that much pressure to force it in that shape?

A. Yes, sir; taking a most conservative estimate it would take 1,657,845 pounds, or 829 tons.

Q. These bolts that you have tested and given the result of your test before the jury, where do they come from?

A. The support of the crown-sheet of that engine.

[564] Q. What part of it?

A. The part just back of this burned area or scorched area.

Q. Why didn't you take the bolts that were in the scorched area?

A. When the engine came there, after having been damaged, came to Princeton, I told our boiler foreman, Mr. Bowden, to save the bolts removed from that engine. He misunderstood me and several of the bolt heads were not saved; he saved the bolt heads only, and what I wanted was the bolt and bolt heads, and when I found that he did not save the ones that were burned, I found that they had all been used in the blacksmith shop to make chains, they selected the good iron for making chains. At that time our instruction was to cut the sheet across as we did there, and electric weld the seams and save that part of the sheet, from there back to the door-sheet.

Q. You mean forward toward the door, you call it backward?

POOR

A. I am speaking of the back part of the engine extending from that end over there to the door sheet of the engine, but our men did not make a very good job of the electric welder, and we decided to cut out the rest of that sheet, which we did, and at that time I saved these bolts which came out just back of this.

Q. Now, I wish you would take that blue print marked [565] Exhibit D, and point out to the jury where those bolts came from that you used in making the test, on that diagram there showing the crown-sheet.

A. The upper part as I hold it here shows the end of the sheet with a row of rivet holes, smaller rivet holes, nearest to the opening, these solid dots show what you see in the sheet now that had bolts in with the heads popped off.

Q. Was that burned area shown by the solid dots?

A. Yes, sir; and as I said before, the burned area extended down until it touched this row of riveted bolt heads, and was just outside of that line, extending back here, they extended around this a little and back here about three rows, and tapered off gradually that way on account of the curve of the sheet. We cut it off right through here (indicating), intending to make a joint across here and not have to cut out that part of the sheet, as that had not been heated enough to damage it. Then I took some of these, I cannot designate which ones, but some of these bolts here from that line back of these bolts that I have been talking about, and some of them came from one of those lines in here (indicating), they are all button-head bolts of the same size and character.

Q. And were they put in there at the time of the manufacture of the engine?

A. The same time.

Q. Was this sheet No. 9 pulled when hot?

A. Yes, sir.

Q. Does it show the indentations of the bolt head around [567] the bolt hole, made when it was pulled hot?

A. Yes.

Q. Does that same indentation around each one of the bolt heads appear there?

A. Yes, sir; only to a greater extent in some cases.

Q. Does that indentation, as far as you can see, in the sheet appear around those bolt holes where it was pulled cold?

A. I cannot see that there is any.

Q. I wish you would have one pulled cold, driven out so that it can be seen.

R COPY

A. Very well.

Q. What did that sheet and the bolt head in the condition you found them in, indicate as to the cause of the failure of this boiler?

A. It indicated that the sheet was hot at the time it came down.

Q. Did it have water on top of it at the time it came down?

A. No, sir.

Q. If it had water on top of it, could it have come down in the way it did?

A. No, sir.

Q. Mr. Slayton, as I understood Professor Randolph the other day, he said that this boiler sheet could not have gone down; that is caused by heating it or burning it, except at a white heat.

[568] What do you say about that?

A. I cannot agree with that.

Q. Were any of these bolt heads, that you pulled the heads off in the tests you have made, at a white heat when you pulled them?

A. No, sir; not near a white heat.

Q. Did you take a record of the strain on these heads at the time the heads were pulled off when they were hot?

A. Yes, sir.

Q. What were they in these two cases, the one you pulled when it was at a dark red and the one at a cherry red? What was the strain on the one at a dark red when the head pulled off?

A. 17,900 pounds.

Q. And what was the strain on the one at a cherry red?

A. It was hardly a cherry red, 6900 pounds.

Q. Did you keep track of the time that Mr. Andrews put in while he was running on the engine, from the time you became superintendent of motive power? I mean did he run regularly or not?

A. No, sir; Mr. Andrews laid off considerably.

Q. On what account?

A. I understood—

Q. (Interposing.) Do not say what you understood unless he told you.

A. He reported that he was unable to go out.

[569] Q. It was testified here that Mr. Andrews made from $125.00 or $150.00 a month to $200.00 a month. How much would he have made if he had run regularly on this division and kept his regular run?

A. I couldn't say without checking up the pay roll.

Q. I don't mean to say absolutely accurately, but just give me your general idea.

POOR COPY

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By Mr. Hunt:

We object to that question. We do not think he ought to guess at how much he could run; he can check up by the records and show how much Mr. Andrews was off and that will be all right.

By Mr. Hall:

I am asking what an engineer running on this division ordinarily makes.

A. If he made every day in the week, which is the best that could be done, of course, at the rate he was paid, he would get $165.00 a month. Of course, that is the regular rate and without overtime.

Q. Do they get overtime on these runs between Roanoke and Princeton?

A. They get overtime if they are beyond a certain time in making the trip.

Q. How long does it take ordinarily to make a trip?

A. On that division from eight to twelve hours.

CROSS-EXAMINATION.

By Mr. Staples:

Q. When did you begin to work for the Virginian Railway?

A. December the 9th, 1910.

Q. Were you ever a boilermaker?

A. No, sir.

[570] Q. You never worked on a boiler, that is, regularly, in your life, did you?

A. Yes, sir.

Q. What did you do about a boiler?

A. I was a helper.

Q. Did you ever study the scientific part of it at college anywhere?

A. I am not a college man; no, sir.

Q. The only experience you have had is just the work you have done during your experience?

A. Yes, sir.

Q. And that constitutes your learning on the subject, doesn't it?

A. I try to post myself a little.

Q. I understand the learning you have has been acquired in that way; you have never studied the theory of it, and you are not a mechanical engineer?

A. No, sir; I am not a college man.

SE IN CENTER

Q. What is the area of a one and one-eighth inch bolt in figuring the strain on that bolt?

(Witness looks at book.)

Q. Cannot you figure it without that book?

A. It is well to check up. It is almost an inch, 99.4.

Q. Practically an inch?

A. Yes, sir.

Q. How do you figure that?

[571] A. The area?

Q. Yes, sir.

A. From the diameter or the circumference.

Q. What would be the circumference there?

A. The circumference?

Q. Yes.

A. 3.1516 or 3.1416.

Q. What would be the diameter?

A. Inch and one-eighth.

Q. Is that measured from the bottom part of the thread or the top part?

A. You asked me one and one-eighth inch bolts?

Q. When you speak of an inch and one-eighth inch bolts, do you mean from the outside of the thread?

A. No, sir.

Q. Then the diameter, you would have to figure that that strength wouldn't be an inch and an eighth?

A. It would depend what part of the thread you are figuring.

Q. You figure the weak end of the thread?

A. That depends where you are figuring, if you would ask me what I figure that bolt—

Q. (Interposing.) You would have to figure from the root of the thread on one side to the root of the thread on the other?

A. Yes, sir.

Q. That wouldn't be one and one-eighth, would it?

[572] A. No, sir.

Q. What was the shop number of that piece of metal that was brought here; that is, the shop number of the Baldwin people?

A. What piece of metal?

Q. Of the metal that went into this boiler, the Baldwin shop number?

A. There are two kinds of metal in the boiler.

Q. I am talking about the tests that these gentlemen here testified to?

A. You mean the shop number of the engine?

Q. Don't look at your memorandum. You said you identified it by looking at the engine at the shop.

A. I don't know what metal you are referring to now.

Q. You remember that one or two men were here from the Baldwin Locomotive Works and gave the shop number of some of the tests?

A. That was the shop number of the engine.

Q. What is that shop number?

A. It is different for each engine.

Q. What is the shop number of this engine?

A. I will find it for you in a minute.

Q. I didn't ask you to find it for me. If you don't know, say so. I am just testing your memory; I just want to see if you remember it.

[573] A. There are 108 engines on our road and I do not try to remember the shop numbers of all of them.

Q. Mr. Slayton, what percentage of engines that are now running on the Virginian Railway, that is the average, I won't say right today, but the general average, what percentage of them have buckled down crown-sheets on them while they are in service?

A. By buckled down, do you mean slight pockets between the stay-bolts?

Q. That is what I mean.

A. Engine 473 had a small place about probably ten inches in diameter where there was a slight buckling and the stay-bolts were renewed in that, and the sheet put back in place. It may show some little signs of having been buckled, or may not have gotten out all the buckle in it, when the sheet was heated and put back in place and the bolts put in.

Q. Is that the only one you have got that is buckled?

A. 437 is now in the shop, she had a sheet buckled that way.

Q. That is not in service.

A. She is going in service; she has got a new flue-sheet, but we did not renew the crown-sheet because it is not bad enough to justify it. Engine 448 had some buckling, I don't know how bad that was that was before I came on the road. I do not know of another engine that has her sheet buckled.

[574] Q. Now, in the customary service of all railroads that you have been with, isn't it true that four or five per cent of the engines are in service with buckled crown-sheets?

A. No, sir.

Q. What per cent would you say?

A. As I said, I could only recall three engines on our road.

Q. I am talking about other railroads, you have answered about the Virginian.

A. I was connected with a road for ten years, in charge of the mechanical department, during that time I had two crown-sheets come down similar to this one. They, of course, were renewed. I had one buckled slightly, which it was not necessary to renew the sheet, and of course, there was probably some little buckle left between the stay-bolts after the stay-bolts were renewed.

Q. They are the only ones you remember seeing in service that were buckled?

A. In my experience as an engineer, I never ran an engine with a buckled crown-sheet, in nine years experience.

Q. Then the only engines, as I understand you to say, that you ever saw before you came to the Virginian, that had a buckled crown-sheet on them, were two?

A. Not buckled; I have seen them blown down.

Q. I am talking down a little bit between the stay bolts.

A. As I say, I have been running an engine for nine years, and I never ran one with a buckled sheet.

Q. I mean all the time you have been working, no matter

[575] what you were doing.

A. In my experience on three different railroads, I have given you the history of those three.

Q. That is all you saw, is that what I understand you to say?

A. Yes, sir.

Q. Then it seems that it is possible to fix these crown-sheets that do not stretch so much but what they can screw another bolt in there?

A. They were not buckled to the extent of this one, by any means.

Q. I didn't ask you that. I asked you whether or not the buckling you saw, or the stretching you saw, was so much as to keep it from fitting the bolt?

A. In all cases we had to renew the bolt.

Q. And put another bolt in there?

A. No, sir; we had to tap the hole out and make a special bolt larger after, and then reset it, heat the sheet and put it back in place, and that would have a tendency to close any seam around the bolt.

Q. What do you call that when you do that? What is the parlance used in railroad circles for that?

A. Putting the sheet back.

Q. I mean doing what you said before.

A. Making permanent repairs.

Q. Is it what you call corking?

[576] A. That is a different thing altogether, corking is taking a blunt end chisel, something like a cold chisel, except it is blunt on one end, and you go and upset the metal around and make the metal flow in around in to fill the crack, that is what we do with seams.

Q. You do that when it buckles a little bit?

A. We wouldn't do that with a buckle, that is, if it is to any extent buckled; but we would do that in a mild case.

Q. That Government expert who testified for the Virginian down in North Carolina, says he can do that. Do you disagree with him on that subject?

A. I don't know at all, but we can do that when it is not buckled too much, if it is not bagged enough to make the right fit. You spoke about buckling, there are engines on our road that have had a slight heating that did not buckle, where it was possible to cork the leak.

Q. When you testified down in Roanoke in the Federal Court, wasn't the question asked you about whether any other engine of this same class had been burned out on the yard at Princeton, and didn't you say there that no such thing ever happened?

A. No, not the same class; I said in this lot.

Q. You didn't say anything about this engine having had filings on it when you were asked about it down in Roanoke?

By Mr. Wingfield:

That wasn't asked him in Roanoke.

Witness:

That was handled outside of the court room, I think.

Q. Why is it that you have to wash these engines every ten days, is it bad water?

[577] A. No, we do not have bad water on our main line, but we do have an accumulation of mud, and we wash them frequently on that account.

Q. If the water is good, it is not necessary to wash them except once every thirty days?

A. That depends, sometimes the water is better than at other times. I mean, when I say the water is not bad, I mean it does not have enough scale forming matter in it to make it necessary to wash

very often, but we at times get water that is muddy on account of frequent rains, and we are getting water from streams, and then we get some mud in them, and to avoid an accumulation of mud, we wash them out before it bakes in there and gets hard.

Q. You have to wash them about three times as often as the Government requires on account of bad water?

A. We do not always wash them every ten days, we wash as often as necessary, sometimes oftener than ten days.

Q. Didn't you say you did wash them every ten days?

A. I said about ten days; it depends on conditions altogether.

Q. You say Engineer Massie having to blow up the steam did not indicate any trouble with the crown-sheet, and that it may have been the coal or it may have been poor firing; it may have been that he burned his crown-sheet and knocked out his engine, might it not?

A. No, sir.

[578] Q. That wouldn't cause a delay, he would just go on if he did that?

A. He wouldn't go on at all.

Q. You don't think he would—you know that sometimes engines burn the crown-sheets and they go right on into Princeton or Roanoke with them on their own steam?

A. Sometimes the crown-sheet has been scorched a little, as I said, and it does come in.

Q. That is what I am talking about.

A. But that is very different from burning, Mr. Staples.

Q. I will change it to scorching, then.

A. There has been at times a slight scorching of the engine which was not so bad but what they could come in and did come in and give us an opportunity to fix them up.

Q. You don't know whether Mr. Massie might have discovered he had low water on that engine and knocked the fire out, until it cooled off, or not, do you?

A. Yes, sir.

Q. You don't know that of your own personal knowledge?

A. No; I wasn't there.

Q. Have you brought Mr. Massie to explain that delay, is he here?

A. No, sir.

Q. Do you break in firemen on these regular runs?

A. We usually promote our firemen from positions around the roundhouse and although they have had positions there and get familiar with some of the work, they have to learn the actual work of fir-

ing an engine by actual experience.

Q. You do not break a man in on one of these regular
[579] runs with a great big freight train, do you?

A. That is all the runs we have.

Q. You do not have any runs in the yard?

A. Switch engine service is entirely different and separate from road service.

Q. I thought you said the only engines you had were these engines?

A. I said the only runs we had—

Q. You do not break in green firemen on these runs, do you make that a habit or not?

A. I frequently have to take a man from Roanoke, for instance, who hasn't fired an engine at all, to take a train back to Princeton.

Q. I want you to tell me the name of one man who never had fired an engine before that you put on a regular run.

A. I cannot recall the names, but just the other day the roundhouse clerk came to me and told me that he had to send a green man out from Roanoke on account of the regular man laying off.

Q. They weren't delayed at all?

[580] A. I didn't look it up, but there was no report of any trouble on that account.

Q. Although they had a green fireman?

A. Some green firemen do well and others do not do so well.

Q. You always have a good supply of firemen in Princeton, do you?

A. We usually have.

Q. You don't have to put any green men on at Princeton?

A. We certainly do; we do not have firemen enough to last us always and we have to keep breaking in new men.

Q. But you do not break them in on these runs?

A. There are no other runs to break them in on.

Q. Do you break them in on these runs?

A. Yes, sir.

Q. You mean to say you make a regular habit of breaking in your firemen on these runs? Is that what you intend to say?

A. There is no other place to break them in.

Q. Just answer my question.

A. Yes, sir.

Q. Do you know that all of these bolt heads that were brought here were picked up out of that engine?

A. I know that the nine were handed me by Mr. Bowden be-

fore the last trial or sometime before that, as the bolts that he had picked up out of the ash pan and had in his possession up to
[581] the time he gave them to me. I took them to the trial in Roanoke where they were shown to the jury and after the completion of the trial there, before we left the court room, I boxed the bolts up and I have had them in my possession ever since.

Q. Did you pick those bolts up yourself ?

A. The other three I picked up from the fire box myself.

Q. You picked up three; how about those other nine?

By the Court:

He said that Mr. Bowden gave him those.

Q. Mr. Bowden gave you those?

A. Yes, sir.

Q. You do not know where he got them except what he said?

A. That is all.

Q. What was done with them after they were given to you?

A. I kept them in my office after he gave them to me.

Q. Whereabouts in your office?

A. In my desk.

Q. Did you turn them over to somebody to put away for you?

A. No, ,si,r; I put them away myself in my desk.

Q. And the only reference that they have to the fire was, or so far as you know, is what Mr. Bowden told you?

A. Those nine?

[582] Q. Which are the three which you picked up?

A. They are numbers 10, 11 and 12. I saw a good many of them in the fire box at the time I picked those up.

Q. How many did you see that were not distorted?

A. I didn't see any.

Q. All of them were distorted?

A. I didn't see any difference in them. I did not select those three, I simply picked up three.

Q. Are these what you call mutilated heads?

A. They are all more or less mutilated.

Q. You were there at the same time Mr. Williams was?

A. I was in the fire box with him.

Q. Did he see the bolt heads that came out of the fire box there?

A. Yes, sir.

Q. You say that the bolts that you had in your office were not

brought down here the last time?

A. To Roanoke?

Q. Yes, sir.

A. No, sir.

Q. And you say that the bolts that were in your office are Nos. 10, 11 and 12?

A. Yes, sir.

Q. Do you mean to tell us that this bolt (indicating) was not down at Roanoke?

A. I will have to identify it.

Q. Look at it, this is No. 10, do you mean to say that that was not at Roanoke in the trial at the Federal Court?

A. Yes, sir; it was not there.

[583] Q. There was a bolt down there that had the thread sticking out like that?

A. You have the nine bolts there that were at Roanoke at that trial.

Q. Do you say there was no bolt at Roanoke at the last trial that had thread sticking out like that, and that was twisted around that way?

A. There was one there very similar.

Q. Please find it for us.

A. They are just as they were.

Q. Where is the one you spoke of?

A. You have all there is to be had; there are fourteen with these two that were pulled in the test.

Q. They were not down at Roanoke?

A. No, sir.

Q. These were all that were in Roanoke?

A. I will identify them.

Q. Isn't it a fact that those two bolts that had these things sticking out like this were at Roanoke?

A. No, sir.

Q. Aren't you mistaken about the number of bolts?

A. Not at all.

Q. You say you did not bring any part of the sheet here except what was distorted?

A. No, sir; there is two corners on the sheet that are not distorted.

Q. I mean the balance of the sheet you left at Princeton

[584] and did not bring along with you.

A. No, sir.

Q. Mr. Slayton, isn't it true that the sudden letting go of a few bolts throws such an additional load on the adjacent ones that they are frequently unable to stand the strain and tear out row by row until the whole crown is blown down?

A. That would apply if it was hot.

Q. Do you think that would only apply where it was hot?

A. Yes, sir.

Q. You don't think that would apply if it was not hot?

A. No, sir; or if the bolts were not heated.

Q. If there was any defect in the bolt, so as to give it a start, it would apply?

A. It wouldn't apply with a bolt put in as these bolts were put in with a head on them.

Q. What do you think of the practice of allowing a few bolts or stays in the crown-sheet, without any heads on, so that in case of a little low water they will pull through right easy?

A. My first experience with a sheet going down was one that had no button-heads, they were all riveted, and when it blew down, it appeared to me that they stripped too easily, that is, as soon as the sheet got hot, it stripped the sheet over the riveted head, and [585] it appeared to me that it would be better to have button-heads on them. This was an old engine that had been in the service probably twenty years, and at that time, when this happened, it was the practice of most railroads to use some button-head stays. There is a difference of opinion as to what is the best practice; it can be argued either way, and either crown-sheet is safe when it is not heated.

Q. What I mean is this, that there is a practice which was advanced by some mechanical engineers, of having one or two bolts put in the upper end of the crown-sheet without any button-head on it, so that when the crown-sheet got hot that would let it down and act as a sort of low water line alarm, you have heard of that theory?

A. Yes, sir.

Q. Isn't it true that that theory failed to work out properly because when one or two of these would let go like that, the whole thing would come down?

A. No, sir.

Q. You don't agree with that theory then?

A. No, sir.

Q. You do think and you say that there is no increased strain on the bolts by reason of some of them giving way?

A. I did not say that.

Q. Do you think so or not?

A. There certainly would be.

Q. Isn't it true that the increased strain due to the momentum and the velocity and the pressure, as soon as one or two of those bolts would give way, would be sufficient to start the crown-sheet
[586] down, and distort the heads on the balance of the bolts?

A. No, sir.

Q. You do not think so?

A. I know it would not.

Q. You know it would not?

A. No, sir; if the sheet were cold or at the right temperature, that is, having water on it.

Q. Do you think that those bolt heads were distorted in that shape before the crown-sheet let down?

A. Yes, sir?

Q. You think, then, as I understand it, that that crown-sheet was strong enough and the bolts were strong enough to hold up that whole business while that bagged around in that condition?

A. Yes, sir.

Q. And bagged to that extent?

A. Yes, sir.

Q. And you think that the crown-sheet would hold that way and not give way, do you?

A. It would hold until the pressure on some bolt or bolts was greater than the tensile strength of the iron, under the conditions then existing.

Q. Now, as I understand your theory, if that crown-sheet was in that condition, all of those holes would be so stretched that if water was put on them they would be leaking very badly, wouldn't
[587] they?

A. Not at that time.

Q. Not when it is bagged down like that?

A. Wait a minute, I will explain, if it had been stopped, that is, if the pressure had been relieved before they actually failed, and then put water back on, it would leak like a sieve.

Q. I am talking while in that condition; I am not asking you while in other conditions, but I am asking you while it was stretched out and bagged down in that condition, do you, or not, think that the holes were stretched around the bolts?

A. Yes, sir; the holes were stretched around the bolts.

Q. Do you not think it was a tight fit at that time?

A. Yes, sir; as long as the bolt heads and the sheet were in a plastic state and the pressure on it, it was; I do not mean a tight fit, it was a comparatively tight fit, the pressure would hold it to the head.

Q. Do you think it was a tight enough fit to keep the crown-sheet from leaking with the pressure from the boiler?

A. It no doubt did leak, but it was leaking steam and not water.

Q. I am talking about the conditions if there had been water over it, it would leak water, in your opinion?

A. Yes, sir; it certainly would.

Q. You think each one of those bolts should be leaking all about the same, don't you?

A. They were not all the same, there is a difference in
[588] the temperature in the highest point of the sheet and that on the side.

Q. If that thing had been bagged down enough to stop those bolts in the shape it was before giving way, wouldn't every one of those holes be leaking a whole lot?

A. You say bagged down?

Q. Like you had it on that red thing.

A. I think you have gotten confused between bagging and buckling or pocketing, pocketing is between the bolts, bagging is on the sheet proper.

Q. Here is what I am talking about now. If just before that explosion, as I understand you to say and think was the effect, that crown-sheet was twisted down in that kind of condition with 185 pounds pressure on it, wouldn't it stretch around here, according to your theory, or bag, and every one of those bolts would have to be leaking the same?

A. It would stretch so big that the threads would give no protection in the way of a fit.

Q. It would be bound to leak some?

A. Not necessarily, until the pressure was relieved or the sheet contracted by the water coming in, it no doubt did leak in some places, but it was steam and not water, there was no water there to leak.

Q It leaked steam there, didn't it?

A. It would.

[589] Q. It was bound to do it according to your theory?

A. I do not say it was bound to, but I would judge it would some.

Q. Wouldn't it be bound to if it was stretched in that condition?

A. No doubt it did leak, but the sheet was bearing on the bolt at the time and in a plastic shape, the bolt head and the sheet.

Q. Just state whether or not in your opinion it would leak steam? Do you or not say it was bound to leak steam?

A. I would say I would consider it would leak some steam; yes, sir.

Q. Do you mean to tell the jury here that the crown-sheet could have gotten in that condition like you have got it in that diagram, and that fireman look in that door, just before it went down, and not see any steam leaking?

A. Yes, sir.

Q. Sir?

A. Yes, sir.

Q. You say the crown-sheet, as I understood, was not strong enough to force the bolts into the kind of shape shown here?

A. I said the bolt wasn't strong enough to force itself into the sheet.

Q. That is not what you said.

A. What did I say?

[590] Q. You said the crown-sheet was not strong enough to distort that bolt or mutilate that bolt like it is shown to be here, didn't you?

A. What I meant was that the bolt did not have enough strength in the body of it to pull the head of the bolt in a cold sheet that way without breaking the bolt.

Q. I thought you said the crown-sheet itself was not strong enough. You did say that; I don't know whether you meant to say that or not.

A. I say that again, the sheet is not strong enough either to do that.

Q. Then why did you say just now you did not say that?

A. I do not think it came up in that way; I will say it now, that the sheet is not thick enough.

Q. Now, Mr. Slayton, did you hear the Baldwin Locomotive men testify yesterday that the crown-sheet and the bolts have the same tensile strength and are able to stand the same kind of strain?

A. Practically the same tensile strength.

Q. And didn't you say here on the witness stand within the last half hour that the sheet is made of a tough steel and the bolts of soft iron?

A. Yes, sir.

Q. And yet you tell this jury that the sheet is not strong enough to twist the bolt?

A. It depends on the thickness of the sheet, the tensile strength on the per square inch, and the thickness of the sheet is three-eighths while the bolt is an inch in diameter.

[591] Q. Do you mean to tell this jury that although you told them that this bolt was made out of iron and the sheet out of hard steel, that sheet wasn't strong enough to twist that bolt like you see it here?

A. No, it is not; the sheet might be as thin as tin and have the same tensile strength as the bolt has, but the sheet being so thin it would bend around the bolt.

Q. Didn't you hear the Baldwin men say they were able to stand the same amount of strain and the thickness was made so as to correspond with the strength of the bolt; what would be the reason of having a strong bolt on there if the sheet was weak?

A. The sheet is not weak.

Q. I thought you said it was.

A. No, sir; I did not say that; the sheet is not weak and the bolt is not weak, and it is capable of standing 13.3 times the pressure they are called on to stand, which is certainly factor of safety enough.

Q. Then it is not a tissue paper sheet, is it?

A. No, sir; it is the usual thickness of sheets.

Q. How hot do you think that crown-sheet must have been to go down just from low water?

A. It was pretty hot.

Q. About what color do you reckon it would have been?

A. It was a good bright red at least.

[592] Q. That bolt that you have over there, that was a bright red, held 6900 pounds, didn't it?

A. It wasn't a bright red, that wasn't like a cherry red. The question of red is a matter—in describing the color, it is difficult for one man to see it and just describe it so that another one will understand. One man would call a thing a dull red, when it showed a dull red in a bright sunlight, and it would show redder if you had it in the dark; but that sheet and bolt at the time it was pulled was what I would call a rather dull cherry red, and then there is a bright red and a clear red, from that on to a white heat.

Q. I don't know what you mean by a bright red then, if a cherry red isn't bright. Do you call that a bright red or not?

A. No, sir; I do not call a cherry red bright; that is a degree

between cherry red and bright or clear red.

Q. Do you not think it would have to be white heat to do that?

A. No, sir.

Q. Didn't the bolts you tried there, at a bright red, or whatever it was you had it, stand more than twice the pressure of that boiler in that condition?

A. Yes, twice the pressure what they would have to stand in that position.

Q. At the maximum pressure of the boiler, isn't that correct?

A. Yes, sir.

Q. And it would have to be heated lots hotter than you

[593] heated it to go down?

A. Not much; they lose their strength very rapidly in those temperatures.

Q. Any way, the bolts ought to have held that sheet while it was so hot when it bent itself around like a snake, like you have got on that diagram?

A. They evidently did.

Q. That is your theory of it, isn't it?

A. My theory is they did until it got somewhere near that contour.

Q. Your theory is that that sheet was hot when it went down and it was twisted into that kind of a wavy shape, isn't it?

A. Yes, sir; it was hotter in parts than it was in others on account of having been exposed to the heat without water on it longer.

Q. You say bolts ought to break in the center if they broke from cold? You mean good, perfect bolts, don't you? If the bolt has got a defective head on it, you wouldn't expect it to break first in the center?

A. That would depend.

Q. I am talking if you had a defective head.

A. If you had no head at all?

Q. Defective sheet too, or defective head?

A. A bolt the size of that screwed into the sheet and with a riveted head to it, would break in the body before it would break in the thread.

Q. That is, if it was a perfect fit?

[594] A. Yes, sir; if it wasn't a perfect fit, it would strip it.

Q. Suppose the bolt head is subjected to a test—

A. (Interposing.) One of these were.

Q. Two of them were, evidently, weren't they?

A. No, sir; I am talking about this that we made the test with.

Q. I am talking about these.

A. Those weren't near the outer edge of the sheet.

Q. They got twisted powerfully, didn't they?

A. Yes, sir; when the sheet went down.

Q. They twisted around that way, and just wrenched their heads off that way (indicating)?

A. Before they were wrenched off they were so hot that they were distorted.

Q. I didn't ask you whether they were hot, I asked you if they were not wrenched as shown by that shape?

A. They are distorted, that is certain.

Q. Wrenched, I said. Do you or not think that the shape of the bolt shows it was wrenched?

A. I don't know what you mean.

Q. One side pulled off before the other side twisted?

A. They are all twisted; one side gave out a little before the other.

Q. That is what I mean.

A. But not until after it was heated and distorted, all over the face of the bolt head.

[595] Q. That looks like the bag went down, and when it went off it just ripped the bolts off sideways all the balance of the way down, doesn't it?

A. No, sir; the sheet was hotter in the center and at the front than it was at any other point, and naturally it would start to go down there first.

Q. Now, Mr. Slayton, which of these sheets over here was it that you had heated up to that dull red heat?

A. No. 9 was the lowest temperature and No. 7 is the highest.

Q. Now, Mr. Slayton, this sheet was a dull red heat, I believe (No. 9)?

A. Yes, sir.

Q. Do you see any hole over yonder that has got any kind of a shape in them, any tendency to pull through the sheet like that?

A. Yes, sir.

Q. Show me one, please, sir.

(Witness goes to crown-sheet and does so.)

Q. Now, I want you to find a hole on here, except where this crown-sheet bends like this, from the level into a curve but along the

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body of this thing, I want you to find one that is pulled in as much as that on the whole crown-sheet.

A. That is pulled in as much at this time?

Q. Anything like as much.

A. Here is the situation, that it was pulled in like that (indicating).

Q. I didn't ask you to explain it. Look and see whether [596] can find one.

A. This was the hottest part of the sheet, and it is not now in the shape this is (indicating).

Q. Can you find any that is in that kind of shape?

A. Not just now, and that is easily explained.

Q. I didn't ask you to explain it.

By Mr. Hall:

Go ahead and explain it.

By Mr. Staples:

You can explain it to Mr. Hall later on.

By Mr. Hall:

I ask that he be allowed to explain it now.

By the Court:

He said he cannot find a hole but he can explain it. You said that was easily explained, now go ahead and explain it.

A. This one here, the one in the upper left hand corner of the crown-sheet, shows pocketing similar to that in the plate, it is in a line of the row of crown-bolt holes to the second one from the flue-sheet, and that bolt did not fail, that is, it did not break clear off, but it was afterwards drilled out, but the pocketing is deepest on the side down toward the next row of stay-bolts which did not fail, and is hardly perceptible on the side toward the flue-sheet, which did not go down, due to the fact that it was so near to the flue-sheet it was supported by that. That gives the best idea of the actual conditions on the sheet previous to the final giving way of the plate, as that did not stretch as did the rest of the plate. This (indicating) was about as cool as any part of the sheet on account of being the last part [597] of the sheet to have been bared of water, and all this (indicating) through the center shows from the print of the bolt on the sheet, the same as shown on the sample, but it also shows that that sheet was blown down which resulted in its being stretched when it straightened out the pockets in the hot sheet, and of course that re-

duced the apparent indentation or the indentation that we have in the square sample, which was not supported by bolts for any distance around it, but was pulled with the plate resting on a support four inches apart at the time and the outer edges permitted to curl up. This sample plate was four inches apart and we were trying to get as near the conditions here, but there was no bolts at these other corners to hold the corners down, it is easily seen here (indicating).

Q. Now, the only hole you could find was one in the corner where the sheet bends?

A. That is at this time, pulled in the shape of the plate.

Q. But you think you can explain why the thing looked different?

A. Certainly.

Q. Now, Mr. Slayton, if that sheet had been in that sort of a snake-like shape like you have got on that chart, and it went down and straightened out like you say, and it was not at a plastic heat wouldn't it have fractured the sheet or shown signs of a fracture?

A. No, sir.

Q. Wouldn't it necessarily have done it?

[598] A. No, sir; one test of that material is to double it over on itself cold and hammer it right down flat cold.

Q. And bring it back without a fracture?

A. That don't bring it back.

Q. This is bringing it to the snake shape and then bringing it back straight.

A. That is done easily.

Q. The bolts that you made these tests from, did they come from the overheated surface of that crown-sheet?

A. No, sir; I have explained that they did not.

Q. They did not?

A. No, sir.

Q. They came from where the crown-sheet did not go down?

A. Part of that sheet that did not go down was heated, but not to the extent this part was (indicating), as I have explained.

Q. They did not come from any of the defective bolts that gave way?

A. No, sir; and I have explained that.

Q. Then you took for your experiment to prove that they were good bolts, bolts that did not break or give way, didn't you?

A. I took the nearest I could get to it, as I explained; I could not at that time get the bolts that did break. I had given instructions

to keep them, but the foreman misunderstood me and kept the heads, not understanding that I wanted the bolts.

Q. I don't care about your reason, I was asking you if [599] that is not a fact?

A. That is a fact, as I have given it to you.

Q. That is a mighty poor test of whether the bolts that did break were defective, isn't it?

A. Not at all.

Q. You think that an engineer with a hot fire blowing could look in there and see whether this crown-sheet had been previously burned?

A. You will have to describe what you mean by a hot fire; if a man has a fire that has coked, that is, has burned down, and the gases burned off, there is no trouble at all to look in by getting down in a position to look in.

Q. Suppose the gases are there so that you have got to have a torch to look around the smoke and gases?

A. Our coal is what they call smokeless coal.

Q. And there is no need for any torch at all?

A. No, I am not saying that; it does have smoke, and when green coal is put in it will smoke for a certain time, but after it is coked, it does not smoke; if there is no green coal and it is sufficiently coked, you have nothing but a dead fire and it does not present anything to interfere with examining the crown-sheet.

Q. When you heat iron to a white heat, it afterwards presents a pitted or scaly kind of appearance?

A. That depends altogether on the conditions under [600] which it was heated.

Q. I am talking about in the absence of any water.

A. Water isn't all that has to do with it; air has to do with it.

Q. You say there was air there?

A. There is always air there; of course, the amount of air has to be considered. If iron is heated in a blacksmith's forge where the blast comes up against it, it has more of a tendency to pit.

Q. But if it is heated in an engine where the blasts come up against it, it won't make it pit?

A. Yes, if it gets hot enough.

Q. I mean if it gets to a white heat.

A. A white heat, if it gets a little more than a white heat it is melted.

Q. I am talking about as hot as it gets in a blacksmith's shop when it pits?

A. They burn it up then.

Q. I don't want to burn it up, but just enough to make it pit a little.

A. After we get to a welding heat, the next thing, if we do not take it out, we will waste it away, especially if it comes in contact with a blast of air.

Q. Now, Mr. Slayton, there is a blast of air in these engines all the time nearly?

A. Any blast of air, except up through the stack, creates a vacuum and the air that gets into the fire box has to come through the grate.

Q. What do you call a blower?

[601] A. A blower, it is the same thing, in a small way.

Q. But those two things are bound to keep a steady flow of air on the crown-sheet?

A. We do not use the blower after we are working the engine, but all the air that comes into the fire box except when the door is open, comes up through the grate, through the bed of fire.

Q. That puffing sound that an engine makes, that is made from air going in there and going out, the vacuum?

A. No, sir; it is made from the steam that goes from the cylinder exhaust up through the stack, that is not air, that is steam.

Q. That is what it makes when he draws the air in?

A. That is what we use to create a draft to furnish air for the fire.

Q. That is what I mean. Now, Mr. Slayton, how much does an engineer get an hour?

A. He is paid by the mile.

Q. How much does he get a mile?

A. It depends on what engine he is running.

Q. Say engine 469?

A. I think it is 5½ cents on that class of engine, but I am not sure.

Q. 5½ cents a mile?

A. Yes, sir.

Q. How far is it from Princeton to Roanoke?

A. I believe it is 97 miles, but they are paid for 100

[602] miles.

Q. Suppose there is a lay-over, do they get any pay for that?

A. Under certain conditions.

Q. What are the conditions?

A. If we have a certain number of men assigned to that division for regular service and on account of the increase in business we put on an extra crew, on account of that extra crew being on, in what we call the pool for a trip, and the regular men are compelled to lay away from their own terminal more than eighteen hours, I think it is, we pay them. It is just a penalty that is put on the company for keeping the men away from their terminal. If there are no extra crews put on they are not paid for any length of time away from home.

Q. There is no extra time put in?

A. If there is no extra crew put into the pool, they are not paid even though they should have to lay away from home any length of time.

Q. Suppose there is a delay on the road?

A. If they are more than at the rate of 11 miles per hour in making the division, they are paid overtime for that.

Q. How many hours is that between Princeton and Roanoke, 11 hours?

A. No, about 9 hours.

Q. If it takes over 9 hours to run from Princeton to Roanoke, they get paid overtime?

A. Yes, sir.

Q. How much do they get paid overtime?

[603] A. I have not the schedule with me, but it is an increased rate per hour.

Q. You do not recall the amount?

A. No, sir; but I think it is about 60 cents an hour or something like that.

Q. For each hour of overtime that the engineer makes?

A. Yes, sir.

Q. The engineer makes a whole lot of money on his overtime, a month, doesn't he?

A. Sometimes.

Q. Don't they nearly always do it?

A. It depends on the division they are on, as a rule they do not, on the third division.

Q. The overtime, as I understand, is all over 11 miles to the hour, is that it?

A. Yes, sir.

Court takes a recess until 2 o'clock p. m.

FRIDAY, OCTOBER 9, 1914, 2 P. M.—AFTERNOON SESSION.

[604] F. T. Slayton, for defendant, still on the stand.

Continuation of cross-examination by Mr. Staples:

Q. When you were in Roanoke, I believe you told us that the water in that boiler, from the way you figured it out, would not be consumed, that is, if the water glass was an inch from the top, between Singer tank and the point of the accident, if the engine was passing along at a nice rate of speed and not being handled roughly?

A. That was assuming a certain amount of water in the boiler.

Q. Assuming the water glass showed an inch from the top, was the assumption in that case, wasn't it?

A. Yes, sir; but by looking at the figures or by referring to the prints of that boiler, I find that there is less water in the boiler than you supposed or mentioned or figured there was then.

Q. Suppose you give us the figures so we can check them up?

A. When you take the actual measurement, it figures about 1296 gallons.

Q. What figures 1296 gallons?

A. The volume of water that would be down in the boiler from a point one inch below the top of the water glass to three inches below the crown-sheet, I believe it was figured.

Q. 1296 gallons?

A. Yes, sir.

Q. How do you get those figures?

[605] A. That was gotten by taking a drawing of the boiler and checking against the measurement.

Q. You think there were 1296 gallons of water between a point three inches below the top of the crown-sheet and a point an inch from the top of the water glass?

A. Yes, sir.

Q. And you figured that much water would be consumed in that much time, in how much time and distance?

A. I didn't figure how much time it would take for that amount of water to—

Q. You figure a difference there of how much?

A. The other was 1550.

Q. That is 250 gallons, isn't it?

A. 254 gallons, but there are other things that were not taken into consideration at that time. I notice the fireman on the engine

claimed the engine was popping off, the engine had a four-inch pop, which consumes 23 gallons of water per minute.

[606] Q. What did you tell us before was the capacity of the injector?

A. 6900 and something, it was very near 7000. That was figured at 180 pounds steam, they do not allow it at 185, and it handles considerably more at 200 pounds, the capacity of the injector was about 700 gallons an hour.

Q. How long do you think that would run at that rate?

By Mr. Hall:

At what rate of speed, Mr. Staples?

By Mr. Staples:

About fifteen to eighteen miles an hour.

A. The engine would consume about 145 gallons per minute.

Q. 145 a minute?

A. Yes, sir.

Q. 116 2/3 gallons a minute if the engine was using all the water?

A. Yes, sir; if you used the full capacity of the injector.

Q. If the engine was using all of the water that the injector was putting in, it would not consume more than 116 2/3?

A. Yes, sir.

Q. Nobody has refuted the fact that one of those injectors will supply that engine.

A. Yes, sir.

Q. And yet you figure 145 gallons and tell us the engine will use that much going along at the rate I suggested?

A. I want to correct that; I had not figured that before,

[607] I had figured the capacity of the boiler, and I see I made a mistake in that.

Q. It is 116 2/3 gallons a minute if he uses every bit of water that the injector will put in it?

A. Yes, sir.

Q. I wish you would give us something by which we can get at the dimensions of the boiler, a blue print or something.

A. I filed with the court at the last trial a drawing of that boiler.

Q. You never did give us anything to show the exact dimensions of the boiler?

A. That is as near as I could do it.

Q. Are your figures accurate or not?

A. We checked them at the Baldwin Locomotive Works, on a large drawing, a working drawing that they used in constructing the engine.

Q. Are the figures that you have given us now different from the ones you gave us in Roanoke?

A. Yes, sir; they are different.

Q. Then since that time you have gotten different figures to work from, haven't you?

A. I got more accurate figures, having access to a large drawing, and a large print, which we did not have ourselves. The builders have large prints to work from in building these engines than we have for our detailed work and shops for repair work.

Q. As a matter of fact, the engine does not, you say, con-
[608] sume all the water the injector puts in?

A. As a rule, they do not require the full capacity of the injector.

Q. So that it would not hardly be fair to say that it would consume 116 2/3 gallons in a minute, running at eighteen miles an hour?

A. We can use that speed as well as any other.

Q. You can use it, but I am talking about the general average that the engineers tell us the engine consumes?

A. As a rule, we would not use the full capacity of the injector, no.

Q. You wouldn't use over one-half of it, would you, of the full capacity of the injector?

A. Oh, yes, sir.

Q. What part of it do you reckon you would use?

A. We would probably work it at seven-eighths of its capacity or something like that.

Q. You think that would be a fair average?

A. I would think so.

Q. Seven-eighths would put it at about 100 a minute, wouldn't it, 100 gallons a minute consumption, it would be about a hundred, wouldn't it?

A. 101½.

Q. Practically 100?

A. Yes, sir.

Q. Approximately, that would be as near as we can get
[609] to it, would be about 100 gallons a minute?

A. Yes, sir.

Q. And if it was running twenty miles an hour and it is 2½ miles from the tank to the point of the accident, that would be about 7½ minutes between the time the fireman looked at it and the time of the explosion?

A. Assuming they were running twenty miles an hour.

Q. As the fireman says.

A. The conductor said he was running eight.

Q. Assuming that he was running eighteen miles or twenty miles an hour, that would be about 7½ minutes, wouldn't it?

A. For what distance?

Q. 2½ miles.

A. At 20 miles an hour would be three minutes to the mile, it would be 7½ minutes, if that is the speed they were making.

Q. If they were running a slower rate of speed they wouldn't use as much water per minute, would they?

A. If they are running at a lower rate of speed it would indicate that they were working the engine harder.

Q. It might indicate that and it might indicate they were [610] drifting down hill?

A. There is no hill to drift down in that distance.

Q. I am talking about generally speaking.

A. You were asking me over a certain piece of road.

Q. You think an engine will be working harder running slow than fast?

A. Yes, sir; usually.

Q. Then assuming it was running twenty miles an hour, as the fireman said, I am asking you to assume the truth of this fact, would it be at all reasonable in your opinion that the water could have been used up in that time even if no injector was put on at all?

A. You ask me—read the question.

(Question is here read to the witness.)

A. Of course it is easy to figure the amount of water that was used if you know how much they use a minute, and how many minutes there are.

Q. That is an irresistable conclusion, is it not?

A. Yes, sir; that is all there is to that.

Q. Now, will you please pick up those two plate laying at your feet and see if they are the plates which you said were tested and were pulled while they were cold. They are, aren't they?

A. I am looking for the identification mark.

Q. Look at your book and tell us if they are not.

A. No. 6 is one and No. 8 is one.

Q. If you can identify them I would be glad if you would
[611] do it.

A. Yes, sir; those are the plates.

Q. Did you or not, before the noon hour, tell us that in that test it would be impossible, on account of the hardness of the plate and the softness of the bolt head, for the bolt head to make any depression in the plate?

A. Not any depression, I didn't say; I said it would make a depression that was made in the sheet.

Q. Please pick up those sheets and look at the depressions and tell the jury whether or not an indentation has been made there?

A. Of course there is an indentation.

Q. From the bolt head?

A. They were pocketed.

Q. I am speaking not with reference to the pocket but with reference to the indentation or what you told us.

A. There is a mark.

Q. There is a very marked indentation from the bolt head in each one of those plates, isn't there?

A. There is a mark.

Q. It is there?

A. Yes, sir.

By Mr. Hunt:

I want to let the jury see it.

(Jury examines said plates.)

Q. These are the sheets that were pulled while they were cold. Let the jury see these.

(Jury examines same.)

Q. Now, you gave it as your opinion that there could be
[612] indentation in those plates, and you held it up to try to see under the bolt head to demonstrate to the jury that there was none before they were driven out, didn't you?

A. I tryed to screw them out to find out if there was any and to give the facts.

Q. Your opinion upon that question was inaccurate?

A. There is more indentation in there than I expected to find from pulling them cold.

Q. And to that extent your opinion was inaccurate, wasn't it?

A. To that extent.

Q. Mr. Slayton, where is that snake picture that you had here?

A. Here it is.

Q. The theory that you advanced was that the depression was made in this sheet while it was hot as shown by the contour of those bolt heads, wasn't it?

A. Yes, sir.

Q. There isn't any mistake about that, is there?

A. No, sir.

Q. Those bolt heads were on bolts four inches apart throughout that entire sheet, weren't they?

A. Yes, sir.

Q. Will you tell the jury whether or not the pressure on those bolt heads and each one of them, and on every part of each one of those bolt heads, was equally distributed, assuming that the bolts

[613] were in proper condition?

A. They should be, yes.

Q. There is no question about that, is there?

A. No, sir.

Q. Now, then, assuming that to be true, if the depression is the same all around this bolt as it is over on this side and that side, will you please explain to the jury why the contour of that bolt shows a depression only on this side and on that one to correspond with your snake picture?

A. Your question before assumed that the sheet was cold?

Q. No, sir; I am asking when it was hot, as you stated.

A. There is where I misunderstood you, the pressure is equal in that side, whether it is cold where it is black than it is, or when it is properly screwed in as you see, and seated, then the pressure is equal, but if we have got the sheet hotter in one place than it is in another, on one side of the bolt than it is on another, the sheet will naturally pocket more there and that will go down on that side. The sheet is not level, and the water takes a level.

Q. I thought you said there wasn't any water there?

A. The water in the boiler takes a level, therefore the water would bare the highest point first, and that part of the sheet begins to heat and would be the hottest when the sheet finally failed.

Q. All right, that much we have gotten down; are you through?

A. Yes, sir.

Q. Now, will you tell this jury, regardless of whether

[614] there is water on the crown-sheet, how there can be any particular distribution of the pressure on any side of any bolt from the steam which is in the boiler, isn't it equally distributed throughout?

A. It is, when it is normal, but not when it is hot, and when it is hot, if your bolt is located at the upper edge of the heated area, the bolts next to it keep that part of the sheet straight, or if it is next to the flue-sheet the support of that flue-sheet to which it is riveted keeps that section of the sheet straight even though it may be hotter than some other part of the sheet that is further away.

Q. Do I understand you to say that that sheet with the steam pressure on that sheet, is greater at a point one inch or inch and a half, different from another point?

A. No, sir.

Q. Now, it is true, that whether there is water on that sheet or not, the pressure downward on that sheet is equally distributed throughout that boiler, isn't it?

A. Yes, sir.

Q. That is bound to be true, isn't it?

A. Yes, sir.

[615] Q. Now then, assuming that the pressure is equally distributed throughout that boiler, how can you account for the contour of the bolt here, and these bolts showing a depression at right angles with the other and not around the entire bolt, unless it is due to the fact of the giving way of the sheet at one end and coming on down with it, can it be explained upon any other theory but that?

A. Easily.

Q. Do it, please.

A. I did do it, I thought.

Q. I am sorry I did not catch it, if you did.

A. There are several conditions there, one is, if that bolt happened to be the one that was in the first row next to the support that it gets from the flue-sheet, this is an upright sheet (indicating) and that supports the sheet even though it is hot, and then there is all the area around the edge where the bolts did not fail and that sheet naturally keeps its contour as originally, or nearly so, and the further you get off from that, the more pocketing there would be, of course.

Q. I have picked up a handful of these bolts and I will ask you if it is not true that those bolts show a more decided depression at right angles, one with the other, than they do the balance of the way around?

A. That bolt?

Q. Examine each one if you desire to do so.

[616] A. There is none of them, or hardly any of them, that are pulled exactly straight, that is exactly straight (indi-

cating).

Q. I say that; that is my idea about it exactly.

A. Yes, sir.

Q. Isn't it true that if your bolt strips through the sheet it has got to do it upon the idea that each and every side of that bolt head gives way to allow it to come through that sheet, isn't that true?

A. The bolt head don't go through the sheet.

Q. I know it don't, but I will come to that in a minute. I asked you if it does go through, and you have got something to break up here like a bolt head, and it goes through, it cannot strip on that side and this side and still go through without the bolt, can it, it cannot do that?

A. The head has to come off before it will go through.

Q. Suppose it strips through with the head, the head has to be crumbled up, on either side, hasn't it?

A. That depends.

Q. If it goes through?

A. If the bolt goes through the head has got to come off.

Q. If the head went through—

A. (Interposing.) This did not go through.

By Mr. Hall:

It did not go through.

Q. Now, then, if the pressure from that sheet, which is your steam pressure only?

A. Yes, sir.

Q. If your theory is true and that sheet is hot and no
]617] water on it, the only pressure you have got in that sheet is your steam pressure?

A. Yes, sir; that is true.

Q. Isn't that steam pressure distributed equally over that entire sheet and every fractional part of an inch of it?

A. I have said that before.

Q. That is true?

A. Yes, sir.

Q. Now, then, if that pressure drives that sheet down against the bolt until it strikes it here (indicating) and makes these pockets, won't it make a pocket on that side and this side as well as on that side and that one, and doesn't the sheet yonder show that condition?

A. It would do that if the heat was equal all around and if there was no other means of supporting that sheet than the bolts.

Q. Do I understand you to say that around this hole you had a certain degree of heat and here another one, and you had a different

degree of heat around different sides of each hole, is that what you mean?

A. No, sir; I have given you two reasons for it; I do not say there is a different degree of heat around two sides of one hole, but there is something besides that particular bolt to support the sheet.

Q. You say there is?

A. Yes, sir; and the condition of the sheet at the next bolt is so that if the water line was between the row of bolts, which it was, the one that is exposed would get hot while the other one would not.

[618] You cannot heat a sheet all over with water on it, and if there is water on it, it does not matter whether it is a large amount or a small amount, it will keep it from getting heated so as to pocket, and it won't be damaged as long as the water line is there, distinctly drawn as to where the water was, and if this row out here is cold or comparatively cold, the sheet is not going down so much on that side as this side where it is hot. This one has not been exposed to heat as long as the other, if the water has gradually gone down, we are going to the center of the highest point, and when we get to the highest point it would be hotter than it would be towards the edges, that is one reason, and that reason extends clear around the whole sheet. Then on the side next to the flue-sheet there is another support besides the bolt, and this sheet under this condition—

Q. (Interposing.) You mean the side sheet?

A. No, sir; the flue-sheet, it is flanged out and extends out far enough to let the crown-sheet lap over on to it, we have a support to that sheet and it is flanged, and helps to hold up the sheet at that point. That accounts for the rivets not going up there in the lower corner, you will notice that the bolts are just as regular in their location and correspond exactly to where the water line would

[619] come to the level of the boiler, showing that the bolts that did go were all under the heated area and the heated area is just what you would find by letting the water level go down in the boiler, it is just a descriptive line that would be described by the water level beforehand.

Q. In your diagram which you introduced here to the court for its inspection, the bolts which you say gave way on this side, were they anywhere near the side sheet?

A. I cannot say where they were, they were just picked up promiscuously in the grate.

Q. Doesn't your diagram show the entire sheet and show that you have undertaken to demonstrate that, beginning with the center of the sheet?

A. I show one side of the sheet in its normal condition.

Q. Haven't you got the center of the sheet marked on it?

A. Yes, sir.

Q. Doesn't this line here indicate the center of the sheet?

A. Yes, sir.

Q. Then this part here and here is not supported by any side sheet, is it?

A. No.

Q. Then the demonstration which you gave to the jury in answer to my question was based upon the support which it would receive from the flue-sheets and the side sheet away off from it, isn't that so?

A. No, here it is.

[620] Q. All right, show me.

A. This is the last button-head radial stay, the water line shows about on a line with this row of bolts, part of the way anyway, down the length of the sheet, it would vary according to the slope of the sheet and the arch, naturally this part of the sheet wouldn't be as hot as the highest part and it is easily seen that this bolt here would get support from this one, this one did not fail, the head did not come off this bolt or it did not pull through the sheet, that one did fail, every one up to the center line shown there did fail, the bolt heads came off and that means that this bolt is supporting in all directions from it, under normal conditions, and would extend half way between this bolt and that one, and then that would support it half of the way and so on. The amount that sheet went down and pocketed would depend on the degree of heat under those conditions, and their heat would not be as great here as there, of course (indicating), because this point is two inches lower than that.

Q. All right. Now, Mr. Slayton, in that diagram which you have drawn, you have a number of bolts and you have likewise given them a corresponding number on that diagram, haven't you?

A. Yes, sir.

Q. You have drawn the contour of that outline to fit the contour of the bolts?

A. Yes, sir.

Q. And you have picked out these bolts there as you have

[621] got them numbered, and you say that was the particular place they came from?

A. No, sir; I didn't say that was the particular place they came from.

Q. If it is not, your diagram doesn't show what you intended

it to show?

A. My diagram was intended to show what the condition must have been at the bolt heads submitted at the time they were put in that shape, but I could not say that that bolt head was here or the other one was there.

Q. But yet you have drawn your diagram to fit them.

A. I have drawn that to fit certain bolts.

Q. And for each separate indenture on your sheet?

A. That has to be explained.

Q. It may need a little explanation.

A. I didn't want to draw a picture that I couldn't show I had a bolt to match, therefore I had to attempt to fit each one of those bolts, or be able to show there was a bolt in this lot that had the contour that was shown in that sheet.

Q. Now, isn't it true that in the diagram which you have drawn here for the enlightenment of the jury, that you have drawn that upon the theory that the pressure on the crown-sheet ran with that line and not cross ways?

A. Not at all.

Q. Doesn't your bolts show it?

A. Not at all.

[622] Q. Will you please take this bolt, which is marked No. 4, and place it in your No. 4 hole and see if it don't fit exactly where you have got it there?

A. I cannot do it there.

Q. Haven't you got to turn it part of the way to make it fit?

A. Yes, sir; and I can turn it another way and it won't fit.

Q. If your theory is right, all of the depression was in a line of the snake, as you have it there, and not in a line of the bagging as shown by that crown-sheet?

A. I could have shown another section, this is a cross-section; I could have shown a longitudinal section, that would only have shown a difference in the height of the sheet.

Q. But you wouldn't get the depressions on your bolts to fit it, would you then?

A. Yes, sir; certainly.

Q. Engine 473 was identical with engine 469, built by the same people, inspected the same way, and under a contract, as No. 469?

A. No. 473, as I stated before, was in the lot built some time later. The general design of the engine is the same; I did not have

the same men there inspecting the engine, and I do not know whether it was the same men at the Baldwin Locomotive Works who inspected them or not, but as a general proposition the engines were the same.

Q. Same type of engine?

[623] A. Same type.

Q. They are supposed at least to go through the same class and degree of inspection, aren't they?

A. They are supposed to.

Q. If the Baldwin people make such good engines, and turn out, as you said, such good engines, why is it that the Virginian Railway Company will see fit to take some of the men from its ranks to superintend its construction?

A. We send men to inspect all important things that are built for the railroad; that is customary for all railroads to do it. We want to know, through our own personal knowledge, we are getting the right material that we pay for and that we are getting the proper workmanship. The Baldwin people themselves have their own inspectors and we have ours. It is the same thing that occurs in everything else that we have built.

Q. Now, I will ask you to please turn to the paper you have and tell me how you identify the Baldwin shop number of that engine with your number, 469?

Q. Now, I ask you to take your paper, from which you say you can identify it, and show the jury how you do it.

A. Engine 469, shop number 37,658.

Q. Now, Mr. Slayton, if the Baldwin say that their shop number was 1246-1/4-E-28, then they are mistaken, are they?

A. No, sir; that is not their shop number.

[624] Q. I asked you for their shop number; I asked you to identify your number 469 with their shop number; I asked you to show me how you do it—their shop number, that is, their private number that they gave that engine?

A. The shop number I gave you is the shop number they gave us as the number of the boiler that we report to the Government, and that is their serial number of the engine as they build them.

Q. You were called upon by your counsel to identify this engine with their shop number which they gave us here, to show it was the same engine as 469. Now, how did you do that?

A. The material that they put into that boiler, our shop number goes with that identification of theirs, they can explain that better than I can.

Q. But you are the gentleman who was called upon to do it, because they tried to show No. 469 and connect up with it, and they could not do it, and now they are gone. If you cannot show this jury that this material which was tested there under their shop number, as they gave it, as your engine 469, how do you expect the jury to think it was the same engine?

A. Here is the sheet that they filled out for us when they built the engine, shop number 37,658, engine 469.

Q. Now, the shop number of the material which they inspected up there was on a different number, some quarter, and E-28, and it wasn't this number at all. How do you identify this as the

[625] material which they inspected there that went into that particular engine, as being this one, if your numbers depart or deviate that much?

A. They do not deviate; one is their serial number which they gave us as the shop number, and the other is their private mark.

Q. Now, what was their number, what engine was their number for 1246-1/4-E-29? What was their shop number for that?

A. I don't know about 29, I haven't it with me; I have 1246-1/4-E-28.

Q. Where did you get that?

A. I got it from page 20 of their record.

Q. And whether that was for this engine you haven't any way on earth of identifying it?

A. Yes; that was shown on their record as engine 469.

Q. Where is the record of that? That is exactly what I want?

A. That is the Baldwin record; that is not my record.

## Re-Examination.

By Mr. Hall:

Q. Mr. Slayton, does the shop number that the Baldwin people connect up with the private number that you took from their record of this engine 469?

A. Yes, sir.

Q. Did you copy that from the record that the Baldwin Locomotive Works keeps there?

A. Yes, sir; from two records.

[626] Q. What two records?

A. Two records kept of inspection; page 20 of their record shows engine 469, shop number 37,658, tested with 267 pounds boiler pressure. That was 1246-1/4-E-28.

Q. Have you got that number in connection with the private shop number of the Baldwin people?

A. I may have it, but I am not sure that I have.

Q. You said you got it from two records and you found one.

A. One is the record of the water test and the other is of the fire test.

Q. And do they both show the same shop number and same serial number?

A. Yes, sir.

Q. Then does that number correspond with your number 469?

A. Yes, sir; I can give the shop number, of course, of all

[627] engines.

Q. We don't want that.

Q. You have been asked about the extent that this crown-sheet was buckled there with heat on it. I wish you would tell the jury whether a crown-sheet buckled in that way, as shown on your diagram there, would leak or not, under pressure?

A. If it had water on it, it would certainly leak.

Q. If it was buckled to the extent this sheet shows it has been buckled between the stay-bolt holes, would it be possible to run that engine with as much burned area as is shown on this sheet?

A. It certainly would not.

Q. Why?

A. Because you couldn't raise steam, you couldn't keep the fire in the engine.

Q. Mr. Staples asked you if the sheet in the condition you have shown it on that diagram there would leak, whether steam would leak through it or not. How long did the sheet remain in that condition in which it left the bolt heads in their final form?

A. It certainly could not have remained in that condi-

[628] tion any length of time; it was evidently heated up and it gave way as soon as it got in that condition.

Q. Did it fail at the time it got in that condition, as shown by your diagram?

A. It evidently did, because that is the extreme position that the bolts got in.

(Witness stands aside.)

[629] N. W. SAMPLE.

N. W. Sample, sworn, for Defendant:

DIRECT EXAMINATION.

By Mr. Hall:

Q. Where are you from and what is your line of work?

A. I live at Ardmore, Pennsylvania; that is my home. I am a traveling engineer for the Baldwin Locomotive Works.

Q. Have you been educated as a mechanical engineer?

A. Yes, sir.

Q. Where?

A. The Sheffield Scientific School at Yale.

Q. When did you take your course there?

A. I took my course there—I graduated there in 1902.

Q. What experience have you had in practical work in the line of your profession?

A. I have been with the Baldwin people ever since I graduated. I served a regular apprenticeship in the shop; I was with the department of tests and experiments for about four years, and foreman in one of the departments and their engineer abroad for several years.

Q. Their engineer abroad?

A. Yes, sir.

Q. Where were you acting in that capacity?

A. In Brazil.

Q. Did you take part in the tests that were made of this material that Mr. Slayton has described of these different bolts that were pulled in the test machine?

A. Yes, sir.

Q. How were those tests conducted?

[630] A. I superintended those tests and we had nine bolts which we experimented with, and we took seven of them and reheated them in the forging shop and we brought them back to Philadelphia, and on some of them we had threads cut and screwed into the plate exactly as Mr. Slayton stated this morning, and those bolts were pulled in our regular testing laboratory in the test machine. Do you want me to go over this in detail?

A. No, I do not think so. Did you try to see if you could pull the heads of those bolts cold?

A. Yes, sir; we tried every way imaginable, on those heads, and heads of that type of bolt in our testing laboratory a good many times during the last ten years, for our information, and we were never able to pull one of those heads off.

Q. Have you ever been able to screw the bolt head in the crown-sheet tight enough to injure it so that you can pull the head off?

A. No, sir; nor in a sheet three times as thick as the crown-sheet.

Q. Have you tried it with a thicker sheet?

A. We tried it with a sheet as thick as the whole width of that thread and never could do it.

Q. What result did you get when you tested it that way?

A. You have got to cut a square on the circular head and the only thing it does is to force the remaining part back upwards and ultimately breaks it off that way, but it never twists the head
[631] off that way, but it never twists the head off at the place where it joins the bolt.

Q. Have you ever seen any bolts broken as these bolts when they were hot, before? I mean the ones you tested; you tested two when you pulled the head, and the heads pulled off in a certain way. Have you ever seen them pull in that same way before when they were hot?

A. Not in testing; no, sir. That is the first experiment that I have any knowledge of, having been conducted at our place.

Q. Did you ever see bolts broken in actual practice down in the head in that way, as those bolts broke when they were pulled hot?

A. Those bolts are the only ones I have seen.

Q. That broke down that way?

A. Yes, sir.

Q. Could that bolt head break off in that way if it was cold?

A. No, sir.

Q. Why not?

A. If proper pressure were brought to bear upon that bolt, it would break in the body when it was cold.

Q. Why would it break in the body?

A. Because it has less metal there in the body.

Q. Suppose you did break it in the head, would it break down into the bolt or break square off across?

A. It would depend upon the temperature at which it
[632] was heated.

Q. I am speaking of cold now.

A. Cold?

Q. Yes, sir; with water on it, the temperature that it would be with water on it?

A. It would not break there; the bolt heads would not break cold there.

Q. Suppose you did make it enough so it would break there?

A. It would break right even with the surface of the head all

the way across.

Q. Why?

A. Because of the difference in the area, that is the strongest part, that is where the bolt is joined on to the head, and there is nothing to prevent it doing that.

Q. How much greater area has to be broken or disrupted, to tear these bolts out down into the head, as this one is, for instance, than would have had to have been to break it straight across?

A. That would have to disrupt about 30 per cent more.

Q. How can you account for it breaking down in the head in the way that bolt head was broken off?

A. On account of the head being heated, this part here (indicating) at the end is much hotter than the part down here (indicating) and in pulling out it reaches down there, takes hold of that metal and pulls it out, it is clear down here, the heat takes
[633] hold of the metal which is hotter and therefore weaker, and pulls it out here (indicating).

Q. Have you had any experience in examining crown-sheets that were burned?

A. The only experience I have had in examining crown-sheets that have been burned has been three or four that have been returned to our works for examination. We occasionally ask to have them sent back to see how they look, or they are sent back for purposes of replacement, so that we can see them.

Q. Have you examined this sheet since you have been here?

A. Yes, sir.

Q. I wish you would state to the jury whether or not that sheet was burned and forced in its present shape when it was hot or cold, that is, did it have water on top of it or not?

A. That sheet presents the same appearance as other
[634] sheets I have examined that have been sent back on account of having been burned, without any water on them.

Q. What are the indications that that sheet was burned without any water on it?

A. One of the best indications that I know of is the holes with the threads in them, which are very nearly perfect; they have opened out and then closed up again, opened up to let the head of the bolt out and closed up again, so that those threads are very nearly perfect; that is one indication, and another indication is the absence of any scale or anything on the water side of the sheet.

Q. If that sheet had gone down with water on it, when the engine was in operation, would there be scale on the top part of the

sheet?

A. There certainly would.

Q. What does the color indicate?

A. The color indicates that it has been heated; the blue color on the other side indicates that it has been heated, and the absence of soot and scale indicates it has been heated.

Q. If that sheet had gone down cold, would there be any soot on the other side of the sheet, the fire box side?

A. By this time it would probably—I understand that sheet is about two years old and probably all of the marks would be removed, but I couldn't say about that.

[635] Q. Does the exposure of iron that has been heated to a high temperature to weather conditions and the time that has elapsed have any tendency to change the color or to remove the marks on the part that has been heated? I do not mean put out in the rain, but I mean in the ordinary atmosphere when the sheet is not covered?

A. Most certainly. Take any moist climate, any place along the Atlantic Coast, where it is moist, the color changes very rapidly, whereas the same sheet placed in a dry climate or the western part of our country, it would probably not show the same changes at all. That has been my experience.

Q. Does the length of time that has elapsed since a piece of metal or sheet has been burned, have anything to do with the color and the line of demarcation that will be shown between the part that had water on it and the part that did not?

A. Why certainly.

Q. If that sheet had been pocketed to the extent it shows it was pocketed between those stay-bolt holes, would the sheet have held water under steam pressure of 185 pounds?

A. No, sir.

Q. Why not?

A. The bolts would all have been loosened up in the holes and the heads probably drawn away to some extent, the heat would have a warping effect on it and loosen up everything and it would leak.

[636] Q. Professor Randolph says that the end of this drum from its appearance ought to leak less than that crown-sheet there from its appearance. Do you agree with him in that?

A. From its present appearance?

Q. Yes; I mean from the buckled appearance between the stay-bolt holes.

A. As it might have been before it blew down?

Q Yes, sir.

A. Yes, sir; I agree with him.

Q. The evidence here of the other witnesses is that it pocketed between the stay-bolt holes to the extent of about three-sixteenths of an inch. Do you agree with that?

A. I never measured that.

Q. Just from looking at it, is that a fair estimate you think of the pocketing between the stay-bolt holes?

A. I think it is.

Q. Is this drum pocketed any between the stay-bolt holes, and can you see it by looking at it?

A. No, sir.

Q. Has that end of it been subjected to any heat without water on it?

A. Yes, sir.

Q. What degree of temperature?

A. About 1800 degrees.

Q. Did that open it up so it leaked?

A. Yes, sir.

Q. When it was pocketed that way, did you have the [637] ordinary engine steam pressure on it?

A. I had 185 pounds of pressure on it; yes, sir.

Q. And how long did you leave that pressure on it; I mean to pocket, to what extent?

A. About one-sixteenths of an inch.

Q. That cannot be seen with the natural eye, can it?

A. No, sir; because the contraction of that drum head has probably drawn that back into the level of the sheet.

Q. Are those bolts that are in there, regular stay-bolts, engine stay-bolts, constructed in the same way?

A. Yes, sir; the same size as this.

Q. And put in in the same way?

A. Yes, sir.

Q. You constructed that drum, didn't you?

A. I understood the sheet would not leak if it had water on it after it had been heated, and I went to work to demonstrate that by making that drum, which I superintended myself. I tried to get as near as possible the actual conditions of the water above the crown-sheet, between the crown-sheet and the roof of the crown-sheet, and also tried to get it as near as possible the condition which

[638] existed on this engine which I understood was the one in question, and I had the drum tested under a water pressure after it was done, so as to make it absolutely tight.

Q. You mean before you heated it?

A. Before any heat was put on it, just as it came out of the shop.

Q. How much water pressure did you put on it?

A. 200. This ought to be shown in connection with this drum—

Q. (Interposing.) Let me ask you first what that is.

A. In order to get the thing clear in the mind of anybody interested.

Q. You tested that with what?

A. That registered there about 200; that is the mark on that steam guage; that photograph was made with this drum full of water, and there were no leaks anywhere in that drum.

Q. Under 200 pounds pressure?

A. 200 pounds water pressure.

Q. And is this a photograph that was taken of it while it was under that pressure, showing the guage?

A. At that pressure, yes, sir.

Q. I will ask you to file that as Exhibit E.

**A. Very well, I will do so.**

Q. Now, what did you do with the drum after you made that test to show that it was water tight?

A. I then heated that space where the bolt heads are to [639] a cherry red heat, without any water in it; I took the water out of it, made it perfectly dry and then heated it to a cherry red heat. I had a small metallic point connected with an electrical circuit which was one-sixteenths of an inch away from the face of this sheet, and when this sheet first, I had better state that after heating to a cherry red, I turned the boiler pressure in here.

Q. Of 185 pounds?

A. Yes, sir; and this sheet expanded until it touched this point (indicating), at that time completing the electrical circuit and it rang the bell, and I then took the pressure off, as I did not care to blow it there; all I wanted was to demonstrate if it would leak, and if I had left it on another two seconds it probably would have blown through, which I did not want to do.

Q. You forced that out or pocketed it one-sixteenths of an inch between the stay-bolt holes?

A. Yes, sir.

Q. Then what did you do?

A. Then I let it cool down and turned the water in it, put water it it, the ordinary city pressure, which was 45 pounds, and you can see there how badly it leaks just under that pressure.

Q. Under the ordinary city water pressure of 45 pounds?

A. Yes, sir.

Q. Does this photograph show how that drum leaked?

A. Yes, sir; and if you will compare it with the other
[640] one you can easily see it. All these black streaks down here, that is a perfectly clear surface there, and that leaks as if blotches of ink had run down; that is the water running out at city pressure.

Q. I will ask you to file this photograph showing how it leaked under the ordinary city water pressure of 45 pounds to the square inch, as Exhibit No. F.

A. Very well, I will do so.

Q. Did you put it under any other pressure? I mean, did you put any other pressure on that drum?

A. Yes, sir; we put 185 pounds on there and it leaked very much worse.

Q. With water in it?

A. Yes, sir; 185 pounds water pressure.

Q. Did you take a photograph of it under 185 pounds of pressure?

A. Yes, sir.

Q. Is this the photograph which shows it under 185 pounds of pressure?

A. Yes, sir.

Q. I will ask you to file that as Exhibit No. G.

[641] A. I will do so.

Q. Did the water, when you did that, stream out around those stay-bolt holes?

A. Yes, sir.

Q. Now, after making that demonstration with that drum, under the conditions that you have described, if that drum had been buckled to the extent of three-sixteenths of an inch between each stay-bolt hole, would it have been possible to have a fire in the fire box of an engine under a crown-sheet buckled to that extent under 185 pounds pressure?

Counsel for plaintiff objected to the question on the ground that the conditions were not the same.

By Mr. Hall:

He stated it was heated under 185 pounds pressure.

By the Court:

Did I understand you to say the first test you made was when you heated this with water on it and got a steam pressure of 185 pounds?

Witness:

No, sir.

By Mr. Hall:

The first test he made he put water in it and put it under a pressure of 200 pounds to see whether it leaked, then he heated it, and in order to make the same conditions exist as existed on the crown-sheet without any water on it or on top of it, he put a boiler pressure there of 185 pounds on it.

By the Court:

What do you mean by a boiler pressure of 185 pounds?

By Mr. Hall:

You used air, didn't you?

Witness:

I used air.

By Mr. Hall:

And regulated the boiler pressure?

Witness:

Yes, sir; with a guage.

By Mr. Hall:

And you left that pressure on until it pocketed between the stay-bolt holes to the extent of one-sixteenth of an inch?

By the Court:

I thought that was the steam pressure.

By Mr. Hall:

No; there is no difference between steam pressure and air pressure.

Witness:

In effect; no, sir.

By Mr. Staples:

One is moist and the other is not.

By Mr. Staples (to witness):

Was the air pressure as moist as the steam?

Witness:

Dry air pressure.

By Mr. Staples:

Air pressure is not moist and steam is, and the other difference is that there is no pressure on the drum when it was heated, but the pressure was put on after it was heated, and then he put the city water in.

Mr. Hall, continuing direct examination:

Q. What temperature was the city water?

A. About 60 degrees.

Q. What temperature was the water when you put the 185 pounds of pressure on it?

[642] A. About 50 degrees.

By Mr. Staples:

In one case it is 65 degrees temperature and in the other case it is 185, making a difference in the expansion of the metal. These were essentially different conditions, and I do not think it is proper to draw a comparison between experiments conducted that way and this locomotive.

By the Court:

Q. How much is the diameter of this drum which you have spoken of, on its face, that is now turned to the jury?

A. 30 inches.

Q. The diameter is 30 inches?

A. Yes, sir.

Q. How high is that drum from the lower or from the side turned to the jury to the opposite side?

A. 18 inches.

Q. Then it is easy enough to calculate the circumference,

[643] so I will not ask you.

Mr. Hall, continuing direct examination:

Q. Read the question.

(Question is here read to the witness.)

A. I think it would have a very apreciable effect upon the fire.

Q. When this drum was under the test you have described, under the water pressure, could you see the water around, streaming around each bolt head in the heated area?

A. Yes, sir.

[644] Q. Mr. Sample, you have seen those bolt heads that were picked up in the fire box of this engine. I wish you would tell the jury whether or not they could have been forced in that shape and the head rounded off as they are, when they were cold?

A. No, sir; they could not.

Q. Now, the evidence is here that that crown-sheet has been buckled or forced down to the extent of ten and three-quarters inches from its normal position. Now, could that sheet have been forced in that position cold, that is, with water on top of it, by any steam pressure that could be developed by an explosion when the engine was set for 185 pounds pressure? In other words, my question is, could that sheet be forced down in the shape it is when the sheet was cold, by 185 pounds pressure?

A. No, sir; I do not think it could because we have a great deal heavy flanging to do like that at the works, and in order to put that set in a plate of that description or a set anything like it, we have to put the sheet in a flanging press of about a thousand ton capacity.

By Mr. Staples:

We object to an experiment of that kind. He can give his opinion, but not the result of an experiment. It is an entirely different situation and it misleads the jury.

Q. How much pressure does it take to force a sheet of that character into that shape cold? I mean when the sheet is cold?

A. About 800 tons, if it could be done.

[645] Q. Could 800 tons of pressure be exerted on that much of the sheet under 185 pounds of steam pressure?

A. No, sir; you couldn't get over 230 odd tons at that.

## Cross-Examination.

By Mr. Staples:

Q. You say you tried to pull the heads of these bolts cold; could you do it?

A. I said twist.

Q. Twist them off?

A. Yes, sir.

Q. Did you ever try it on a head that was cracked?

A. No, sir; I never tried it on a head that was cracked.

Q. Do you reckon that would pull off all right, don't you?

A. If it was cracked half-way, I don't think there would

[646] would be any trouble.

Q. If it was part of the way?

A. Yes, sir; very likely.

Q. You say that the principal reason, or one of the reasons why you think that crown-sheet over there came down from low water was because of the absence of scale; that as soon as it gets hot all the mud scale and everything burns off?

A. Yes, sir.

Q. I want you to come over there and see if you cannot find a little mud scale on this sheet. See if this is not mud scale all along here (indicating).

A. Right up close to the portion of the sheet which was cooler, there is a small quantity of scale which was probably thicker at the time.

Q. You think this end was the cool end?

A. This side here (indicating).

Q. I am talking about in the center here (indicating), where the bolts have all gone away, right here and all along in there where it did the pulling?

A. Very small quantity happened there, all that adhered to the top which was not heated at all, you couldn't expect it to remove every particle.

Q. That is the highest part of the crown-sheet up there, and gets hot the quickest?

A. That is the highest part.

[647] Q. Is that the hottest part or the coolest?

A. Neither one.

Q. The water gets off the highest part first, doesn't it?

A. Yes, sir.

Q. You say the reason you made that experiment was because you heard that sheet wouldn't leak after it had been heated and you wanted to try it?

A. Yes, sir.

Q. Who told you it wouldn't leak? Is that what they said around the Baldwin Locomotive Works? Where did you hear that?

A. I heard that had been alleged in the previous trial of this case.

Q. Didn't you say you heard it around there; that one of them

wouldn't leak? That is what you said, that a sheet wouldn't leak that had been heated?

A. I heard it had been alleged it would leak if it had been heated with no pressure on it, and after pressure had been turned into it.

Q. That is not what you said.

A. What I said is in the record.

Q. You said you heard it would not leak and you tried it to see. Why didn't you try it under the same kind of conditions that would exist in a boiler?

A. That is the same condition in effect, substantially, as any engineer will admit.

Q. You think that is the same kind of condition, a flat [648] sheet?

A. For all practical purposes; yes, sir.

Q. You could have gotten an eliptical shape or some sort of a curved circle?

A. Yes, sir; but it would not have affected the experiment in the least.

Q. No man can say what iron will do; he can form the best opinion he can.

A. The curvature of that sheet is practically nothing. That represents a portion of the sheet as well as if it had been curved slightly.

Q. That sheet over there is curved, isn't it?

A. You mean, could I bulge it up?

Q. Yes, sir.

A. I could have let it gone more and let it gone all the way through.

Q. When you built your drum you could have put it in a shape like the crown-sheet is instead of being flat?

A. The main arch in that short space there wouldn't warrant your going to the expense of doing it, it would only have been one-sixteenth or one-eighth probably.

Q. You also could fix it so it would not be protected around on all sides by a solid piece of metal that would force it to expand all the way into the center, couldn't you; couldn't you change that and have allowed it to have room to expand, instead of having it concentrated in the center of the drum?

A. That does not expand any more than a boiler sheet would.

Q. Isn't all of it concentrated in the center?

A. No, sir.

Q. Where does it go?

[649] A. The expansion goes out under.

Q. Under what?

A. Under the sheet; only a part of the heat was under the drum.

Q. You heated it right in the middle, didn't you?

A. I heated it all over that end.

Q. This is all enclosed here.

A. I heated it over that whole end.

Q. And it is all enclosed around and locked around, isn't it?

A. Riveted around.

Q. Like that (indicating), so as to enclose it in the center?

A. That does not affect the bulging of it in the least.

Q. You mean to say that enclosing that thing that way doesn't make the pressure all concentrated to the center?

A. I mean to say it does not have anything to do with the effect of the experiment.

Q. Which is the weakest part of it?

A. I don't know that you would have any weak part. It is thoroughly riveted and stayed and one part is as strong as another.

Q. That did not have any pressure on it when you first heated it, did it?

A. No, sir.

Q. You got it up to your heat before you turned in your pressure, didn't you?

A. Yes, sir.

Q. That is not like a locomotive, is it?

A. No, sir; it is not.

[650] Q. You also shoved cold water in there, too?

A. After it cooled off absolutely.

Q. At about 60 degrees temperature?

A. Yes, sir.

Q. That is not like a locomotive, that is fired up, is it?

A. The effect of water going in there is just the same as the water in a locomotive boiler going over the sheet; it is more or less some cooler than water going into that thing at a relatively lower temperature.

Q. When you heat metal it expands?

A. Yes, sir.

Q. If you heat that thing it not only makes the sheet expand but it makes the bolt expand and tends to fill out any cracks?

A. The bolts will expand some and the sheet will expand some.

Q. The necessary result of that would be the filling up of the little cavities in there, wouldn't it?

A. Not that I know of.

Q. Where would all that go, that expansion?

A. One would expand and the other would expand to [651] follow it; there are no cavities to fill up.

Q. But it would fill up any little cavity in there?

A. Cavity where?

Q. Between the bolt heads and sheet, that fits around the bolts?

A. There is no cavity except the thread, and one follows the other.

Q. There is a little hole in there, or something?

A. Not when the end is perfectly tight.

Q. Not when perfectly tight; it is not perfectly tight when it leaks?

A. It leaks when it is hot, after it has been heated only.

Q. I am talking about those pictures that were taken in a temperature of 60 degrees; that is true, isn't it?

Q. If you had heated that to the temperature of the boiler, under the full heat, I say that it would have expanded the head of the bolt and the sheet of your drum, and in that way those two become enlarged and would fit tight, stopping any leak, isn't that true?

A. No, sir; the head of the drum would have expanded and the heads of the bolt would have expanded, and the co-efficiency of the expansion of one is about the same as the other, and you have the same amount of leaking. If the sheet was copper and the heads were steel, it might have that effect, but they are both the same.

Q. If the bolts expand they would get larger, and as the [652] metal expanded they would get smaller?

A. Not necessarily.

Q. The bolts get larger, don't they?

A. One expands and—

Q. (Interposing.) Suppose this has got holes in this here (indicating), when you heat it, do you mean to tell me those holes won't get smaller when that sheet increases in size?

A. Very likely.

Q. Very likely it will?

A. Yes, sir.

Q. And the bolt heads getting larger, wouldn't that make a tighter fit, if the bolt holes get smaller and the bolt heads get larger?

A. It might make a slight effect on the tightness of that.

Q. Now, what is the temperature of a locomotive boiler at 185?

A. The temperature of the steam?

Q. Yes, sir.

A. About 380, as I remember it.

Q. 380, that is about 320 degrees hotter than you had yours, isn't it?

A. Yes, sir.

Q. You said you saw some sheets up there that went down from low water, sent up to the Baldwin Locomotive Works. How do you know they went down from low water?

A. A matter of common knowledge, the railroad had ad-
[653] mitted it, we sent for it.

Q. This railroad here admits it. Did you ever see a railroad that did not admit that they go down from low water?

A. No, sir; they all do go down from low water.

Q. That is always what they say?

A. That is always what they do.

Q. That is the only proof you have got that those crown-sheets that came up there came down from low water, was the admission of the railroad company?

A. That is all; yes, sir.

Q. Stretching iron removes the scale the same as heat does, doesn't it?

A. It loosens it up and it dries off.

Q. That sheet is certainly stretched?

A. No, sir.

Q. Where is that water line? Didn't you say you saw a water line over there?

A. Yes, sir; very clearly.

Q. Just point it out.

A. It is around where that lighter color is, just about where the belly commences.

Q. If there had been a water mark on that sheet in Roanoke, in February last, it would have been plainer then than it is now, wouldn't it?

A. Yes, sir; if that sheet has been scuffled around very much, I should say so.

RE-EXAMINATION.

By Mr. Hall:

Q. And it would have been plainer just after the explosion in November, 1912, than it was in February, 1914, wouldn't it?

A. Yes, sir.

Q. Were those locomotives that your company had built
[654] for the railroads that you say that the crown-sheets had gone down?

A. I couldn't say about that; they had sent to us to replace them; they were smaller roads in foreign countries generally.

Q. I wish you would walk over to that sheet and indicate to the jury the low water line on this side of the sheet. It is not necessary for the jury to go there, you can just point it out.

(Witness does so.)

Q. How is that line shown? What indications are there of that low water line?

A. There is no scaled in the burned part, and the part around the edges, the scale is there. I pointed to this mark here (indicating), I wont' say absolutely no scale in certain places, but all the way around here is the burned part, all the way around the bottom here has more or less scale.

Q. You mean there is more or less scale around the edges,
[655] outside the burned area?

A. Yes, sir; practically none on the inside.

Q. If that crown-sheet had been burned prior to the time it started on this trip, would there have been any deposit of soot on the fire box side of it over the burned area, in running twenty miles, with this engine operating?

A. No, sir; it would have burned it all off.

Q. I do not think you understood my question. If the sheet had been burned prior to the time Mr. Andrews took it out on this trip, would the running of the engine and the hauling of a train for a distance of twenty miles have deposited soot on the burned part of the sheet?

A. Providing it had water over it?

Q. Yes, sir.

A. Yes, sir.

Q. Was any soot deposited on the edges and the corner of the sheet where it was not burned?

A. I cannot say there is any soot there; that soot has been removed probably by moving the sheet about.

Q. Would the soot be burned off the burned area of the sheet? I mean if the sheet was burned with no water on top of it, would that take the soot off the burned area?

A. Yes, sir.

Q. When the sheet first went down, would the line of demarca-

tion between the burned area as shown by the soot be very distinct?

A. I think it would, at the time the boiler was examined, but not now.

RE-CROSS-EXAMINATION.

By Mr. Staples:

Q. When iron is heated to a real bright red heat, it has a sort of reddish oxidation, doesn't it?

A. It depends on the conditions of heating it.

Q. I mean in the absence of water.

A. After it cools off there is oxide formed.

[656] Q. A reddish oxidation?

A. It may be reddish or bluish red, or it may be blue, it depends on the degree of heat.

Q. When it is heated to an intense heat like a bright red or white, you have a red oxidation, don't you?

A. It may be red or not, most likely it would be red.

Q. And the more intense the heat the redder the oxidation?

A. I cannot say that.

Q. Would you say the reverse?

A. I wouldn't say the reverse; I would have to know the conditions under which the heating was made.

Q. I mean assuming the conditions were the same, that is, in the absence of water.

A. How about the absence of air; it depends on the absence of air and the presence of a larger or smaller quantity of air, what kind of oxide you will get.

Q. I am assuming that is the same.

[657] A. If a piece of iron is put in a blacksmith's forge and heated to a certain degree of redness, you will get a certain color of oxide, if it is heated in the open air to the same degree of redenss you will get another kind of oxide.

Q. What is the difference?

A. The difference is the amount of oxygen that is exposed to the iron and it will be a different color.

Q. Which is the redder?

A. I cannot say.

Q. Where you get the most oxygen?

A. I couldn't say the exact temperatures as to the different colors oxide is formed.

Q. Go to the drum and see if that is not red inside?

A. That is red inside. I know how high that was heated; that is all I know.

Q. Can you find anything like that on that crown-sheet?

A. Not any red like that.

Q. You don't see any reddish color at all?

A. Nothing like that; that was heated in the air, and the crown-sheet was heated inside the engine.

Q. The crown-sheet was heated with a strong draft being blown over it, wasn't it?

A. Yes, sir.

Q. Plenty of air?

A. There should have been.

Q. That was not heated beyond a cherry red, as I un-
[658] derstand?

A. No, sir.

Q. Now, at a cherry red, what pressure ought those bolts to be able to withstand? How many pounds?

A. At a cherry red the same as that was heated?

Q. Yes, sir.

A. Those bolts would stand about 16 per cent of their original strength.

Q. What temperature is a cherry red?

A. Or rather 6 per cent. The temperature of a cherry red is 1800 degrees.

Q. About 6 per cent you say?

A. Yes, sir.

Q. You mean 16 per cent?

A. No, sir; I mean 6 per cent.

Q. Isn't it true that heated to a bright red or a cherry red heat, those bolts will withstand a temperature of from one-fourth to one-fifth of their strength cold?

A. Not to a clear cherry red, the same as that was heated.

Q. Do you deny that?

A. Yes, sir.

Q. Do you or not think that a seven-eighths of an inch button-head groove bolt at a cherry red heat will withstand the pressure of 75 hundred pounds?

A. At a cherry red heat?

Q. Yes, sir.

A. Yes; I think it would at a cherry red; but not a clear
[659] cherry red, that is, if you take a cherry red as 1200 degrees; yes, sir.

Q. You draw a distinction between a cherry red and a clear cherry red?

A. Yes, sir.

Q. Was this a cherry red or a clear cherry red?

A. A clear cherry red, corresponding to 1700 Fahrenheit.

Q. That is near white then?

A. No, sir; that runs up to 2400.

Q. That is about four more?

A. This is 400 less than white heat.

By Mr. Hall:

Q. You have been asked about that red oxidization on the head of this drum. What appearance will that present two years from now?

A. I cannot say; but very much different from what it is now. That red oxide will probably be all knocked off there. More than likely it will be quite blue, depending on the condition in which it is kept. If it is out in the air it will probably deteriorate and discolor very quickly. If it is kept inside in a dry place possibly two or three years wouldn't make very much difference, but it will make some.

Q. It will make some?

A. Yes, sir.

By Mr. Staples:

Q. You think in two years or so that drum will look like that crown-sheet, won't it?

A. That would only be a guess; but I guarantee it will be different from what it is now.

Q. If the Government inspectors, who examined it a day
[660] or two after the accident, said it was blue, it wasn't the same as that drum?

A. That drum is blue.

By Mr. Hall:

Q. How was that heated?

A. That was heated with an oil torch.

Q. Did you use a blow pipe in heating it or any kind of a bellows?

A. No; a regular oil torch is used in connection with it.

Q. And air forced in?

A. Yes, sir.

Q. Was there, or not, a strong current of air there?

A. Yes, sir.

Q. Does an oil flame oxidize more than an ordinary coal fire?

A. Yes, sir; considerably more.

By Mr. Staples:

Q. It won't oxidize any faster than a coal fire with a blower on it, will it?

A. Yes, sir.

Q. What makes you think that?

A. Because there is some confinement to the air through coal itself, and there is nothing from an oil torch.

Q. Do you mean to say the air would not have access to [661] that crown-sheet as much as to this?

A. I mean to say in a coal fire the air has more interference coming through the coal and the oil torch flame itself is carried by air.

Q. And you think there is more air than the crown-sheet?

A. Yes, sir.

Q. And this was just heated with an oil torch?

A. Yes, sir.

Q. When you are testing the holding strength of iron, you place it in clamps, don't you?

A. Yes, sir.

Q. You are bound to do that to stretch it?

A. Yes, sir.

Q. If the parting of the iron takes place in the clamp, do you count that test?

A. No, sir; we never count it.

Q. The reason for that is because the holding power of iron would be increased in proportion or as the power of the clamp would increase it?

A. It would make a considerable difference in the result of the test.

Q. I want to ask you if this piece of iron was not parted in the clamp and if it does not show the pressure of the clamp on it?

A. No, sir; that is our inspection number, those are the letters "B. L. W." there.

Q. I don't mean that; I mean here (indicating). Doesn't it show all through that?

A. No, sir; this was not caught in the clamp at all; that [662] is the stretching of the iron and the scale coming off.

Q. That does not show the clamp?

A. No, sir.

By Mr. Hall:

Q. You have got the other end of the bolt, haven't you?

A. It is here somewhere.

Q. Do you know where it was?

A. I think I can identify it by the number. I can find the number on that.

Q. Was that one pulled cold or hot?

A. This is No. 5, pulled cold.

Q. Please see if you can find that?

A. No; it pulled out of the clamp, the clamp only had it as far as these marks; it broke right close to the clamp, but not in the clamp, the clamp stopped up here (indicating).

By Mr. Hunt:

Q. What made these things here (indicating)?

A. That is where the scale and the fibers pulled away.

Q. Was it pulled out of the clamp?

[663] A. The marks took place very close to the clamp in this one, but not in the clamp; it did not break in the clamp, it pulled the fibers away from the clamp, the action being this way, indicating, and broke them on the outside.

Q. Mr. Sample, was this tested under the same conditions that the other was, with a three-inch ring around it, a three-inch ring under this flat surface and around the bolt?

A. What is the number of that one?

Q. How was this end of it held?

A. Yes; that was held in the same way.

Q. How was it that the plates in these cold tests show that they gave way in the center and that don't (indicating)?

A. Because there was a difference in the pulling strain of the iron.

Q. That was weak iron then, was it?

A. What number is that?

By Mr. Hall:

No. 5. Get your record of the test and look at it.

A. Yes, I would like to look at that. (Witness examines record.) That wasn't held in the same way, it was held closer up here (indicating).

Q. It wasn't held in the same way?

A. No, sir.

Q. There was no chance given there for the plates to bend?

A. No; not in that one.

[664] Q. Does your record show how that was held?

A. The records do not show how it was held, but it was not held in the same way.

Q. Is there any mark on it to indicate where it was held? None in the world, is there?

A. There is a mark there that shows; there is where the mark shows (indicating); the washer was of smaller diameter than the other ones were held with; there is the mark right there (indicating).

Q. The pull on that piece of iron wasn't hard enough to make a mark up against this plate to show where it was held, was it?

A. Yes; it shows where it was held; right here, clearly (indicating); right around there, can't you see it?

Q. No, sir; but I will take your word for it; just so it is there.

A. There was a smaller washer on it.

By Mr. Hall:

Q. Under what strain did that break?

A. That broke under 42,100 pounds; that was the breaking strain and the tensile strength of that was 53,250.

Q. To the inch?

A. Yes, sir.

Q. What was the tensile strength of the other two that were pulled cold?

A. 51,190 for one and 52,900 for the other.

[665] Q. There is practically no difference between the three, is there?

A. That is a little higher than any of the others.

Q. Which one is a little higher?

A. No. 5.

Q. The one that the sheet is not bent at all?

A. Yes, sir.

By Mr. Hall:

Q. Isn't there a piece of rust in that break? Take a glass and look at it?

A. Yes; that is a piece of rust.

Q. And there is a flaw in that iron?

A. No, sir; there is no flaw in the iron; just a drop of water got in the iron, that is all.

Q. That drop of water hasn't been in there since it was broken?

A. Yes, sir.

Q. Put a glass on it and see if it doesn't extend into it?

A. You can only see on the end, you cannot see down in it, you couldn't see down in it without breaking it more.

Q. Do you think that drop of water got on it since?

A. Yes, sir.

(Witness stands aside.)

[666] At this point, the deposition of Robert M. Williams, taken at Tarboro, N. C., on the 28th day of September, 1914, was read to the jury, as follows:

North Caroline,
Edgecombe County:

[667] DEPOSITION OF ROBERT M. WILLIAMS.
(Read to the Jury, October 9, 1914.)

Present: A. P. Staples, Jr., for the plaintiff; G. A.. Wingfield, for the defendant.

Robert M. Williams, being duly sworn and examined, says:

By Mr. Wingfield:

Q. Please state your residence and occupation?

A. Rocky Mount, North Carolina, and I am district inspector of locomotive boilers for the Interstate Commerce Commission.

Q. How long have you held that position?

A. Since January 2nd, 1912.

Q. What was your occupation prior to going with them?

A. I was foreman boilermaker at South Rocky Mount.

[668] Q. For how long?

A. About seven years.

Q. And what experience did you have before you were foreman?

A. About twenty years experience.

Q. In your experience as boilermaker and foreman and inspector, have you examined boilers which exploded from low water, as well as other causes?

A. Yes.

Q. Did you make an inspection of the boiler and stay-bolts of engine 469 after the explosion of that engine, which occurred on the Virginian Railway?

A. Yes, sir; I did, with Inspector Pfahler.

Q. When did you make that inspection?

A. Yes, sir.

A. In November, 1912.

Q. Please state in a general way what was the condition of the crown-sheet of the boiler and stay-bolts and other appliances, when you made the inspection.

A. The crown-sheet was partly down, about ten inches I should say, and about 150 or 160 bolts pulled out of the sheet, with the heads off.

Q. In the first place, what was the condition of the bolts, into which the stay-bolts were screwed?

A. Threads were left in the bolts, some were elongated.

Q. Where were the stay-bolts broken?

A. Right under the head.

Q. What was the condition of the crown-sheet where the
[669] bolt heads had been screwed up against them?

A. Considerable pressure of the bolt heads and a slight bag between the bolts.

Q. What was the color of the iron in the crown-sheet?

A. It seemed to be a bluish color, like it had been hot.

Q. In the construction of these stay-bolts, where is the largest part of the bolt?

A. Right under the head and the point that screws into the crown-sheet.

Q. That part that is in the boiler is smaller than the ends?

A. Yes.

Q. When do you think low water occurred with reference to the explosion?

A. Must have been at the time of the explosion.

Q. You have spoken of the bluish color of the crown-sheet. What would that indicate?

A. That it had been heated.

Q. Was there any blue color on the bolts?

A. My recollection is that there was.

Q. At what time did this color indicate that the crown-sheet and bolts were heated?

A. At the time of the explosion.

Q. What did the elongation of the holes indicate?

A. Depression of the sheet.

Q. What did the breaking off of the bolt heads indicate?
[670] A. That they were hot.

Q. At what time?

A. At the time of the failure.

Q. What did the failure of the threads in the sheet to strip indicate?

A. That the sheet was hot.

Q. When the bolts break cool, where do they break?

A. At the weakest part?

Q. Please state how the head of the bolt and that part of the bolt which is threaded and screwed in compares in size with the other portion of the bolt.

A. It is larger.

Q. And when these bolts break under pressure when not heated, where do they break?

A. I cannot say where; they would be more apt to break at the smallest and weakest part.

Q. What did the prints of the bolt heads in the crown-sheet indicate?

A. That the crown-sheet was heated.

Q. At what time?

A. At the time the bolts failed.

Q. Was there any mutilation of the bolt heads themselves?

A. Not that I saw.

Q. Were any of them out of shape?

A. Not that I saw.

Q. Now, if that engine had been overheated—

[671] Q. Assuming that the crown-sheet had been heated sufficiently to cause the boiler to give away in the manner in which it did give away on this occasion, could the engine have hauled a train of 80 empty coal cars for a distance of approximately 20 miles before giving away?

A. I don't think so.

Q. Is it possible for an engine to have been heated as indicated by the last question and run for a distance of 20 miles without giving to the train crew indications of its condition?

A. I don't think so.

Q. What would have been the effect produced by heating the engine sufficiently to have caused it to give away in the manner in which it did and then allow it to cool off and attempt to haul a train with it?

A. I don't think they could have gotten any service out of it. It would have leaked.

Q. Could there have been any water on the crown-sheet at the time it gave away?

A. No.

Q. Did you examine the injectors that were on the engine?

A. Yes.

Q. In what condition did you find them?

A. Good.

Q. Were they in proper working order?

A. Yes; they worked all right.

Q. The valves to pipes leading to them were open?

[672] A. Yes, sir; free from obstruction.

Q. To what test did you put them?

A. I put them on another locomotive and tried them with different pressures of steam, under three different pressures, from less than one hundred up to 185.

Q. Were those three pressures at which you tried them, working pressures? Were they injectors of approved pattern?

A. They were standard injectors and in common use, I understand.

Q. Did you examine the guage cocks?

A. Yes.

Q. In what condition did you find them?

A. In good condition.

Q. Did you examine the water glass?

A. Yes.

Q. In what condition did you find it?

A. Good.

Q. What examination did you make of it?

A. Removed the glass and fittings from the boiler and blew through the cocks and removed the stems to see if they were clean.

Q. What was the condition of the entire engine?

A. Good.

Q. Suppose this engine had been overheated at Roanoke, but not enough to cause the engine to leak, would the engine have been weakened?

A. I don't think so.

[673] Q. Could the fracture in the stay-bolts have been caused by twisting the bolts too tightly into the boiler?

A. I don't think so.

Q. Please give your reasons.

A. I don't think it would be possible to twist a bolt that size in putting it in.

Q. Does your business as Interstate Commerce inspector cause you to be familiar with the character of engines used by the various

railroads in this section of the country?

A. Yes.

Q. You are constantly examining them?

A. Yes.

Q. Do they have in them, that is the modern engines, what is called soft plugs?

A. Not those in service in this section of the country.

CROSS-EXAMINATION.

By Mr. Staples, for Plaintiff:

Q. Where was your first training received in connection with boiler work?

A. With the B. & O. railroad, in Piedmont, West Virginia.

Q. How long did you work for them?

A. About ten or eleven years.

Q. What were the titles of the positions you held?

A. First I was an apprentice, then a boilermaker.

[674] Q. Did you go through the regular apprentice course?

A. Yes.

Q. How long were you boilermaker for the B. & O.?

A. For six or seven years.

Q. Then you went from there?

A. To Elkins, West Virginia.

Q. With what company?

A. West Virginia Central. I was there six years.

Q. What was your position there?

A. I was boilermaker.

Q. Where did you go from there?

A. To South Rocky Mount.

Q. With the A. C. L.?

A. Yes.

Q. And your position was partly boilermaker and partly foreman of the boilermakers?

A. Yes.

Q. You have never had any technical training except what you have gotten in actual experience?

A. No.

Q. It has come within the line of your work to study the strain that the bolts can stand, has it not, and the different kinds of pressure on different heats?

A. I have never studied that. I have had occasion to look it

up, though.

Q. Are you familiar with the publication called the "Transactions of the American Society of Mechanical Engineers"?

A. No.

[675] Q. I have here the transactions of that society, which was published in 1897, and they show certain experiments that were conducted with reference to determining the strain that stay-bolts were able to stand. What was the character of the bolt on this engine?

A. I think it was what we call an inch and an eighth bolt.

Q. Was there a groove below the head?

A. I don't think so; I don't remember.

Q. Do you know whether it was countersunk or not?

A. No.

Q. Then there must have been a groove?

A. Yes; I suppose so. I don't remember.

Q. He has a class of experiments recorded here, in which bolts of that character are shown to sustain a pressure of something like 27,000 pounds. Is that in accordance with your information on the subject?

A. I have several times seen different figures given by different people.

Q. That is generally accepted, as to the pressure they can withstand?

A. Something like that.

Q. He also says here, that when these bolts are heated to a dull red, that the pressure is reduced about one-half. Is that in accordance with your experience?

A. I can't tell anything about that. It makes them softer the hotter they get.

[676] Q. He has shown here, that when the bolts are heated to a bright red heat, bolts of this character with the button head, that it will withstand a pressure of something like 8,766 pounds. Do you not think that correct?

A. I don't know. I can't answer it positively.

Q. Are you informed on the subject?

A. Not as to what a bolt will stand in different degrees of heat.

Q. Do you mean you have no idea about that? If you have any information on the subject, as to what pressure a bright red heated bolt of this character will withstand, I wish you would tell us.

A. I can't carry that information on my head.

Q. You don't know, then, how hot that boiler would have to be, if the bolts were in good condition, at a pressure of 185 pounds, for it to go down?

A. No.

Q. You have no idea in the world?

A. No, sir.

Q. Do you think it would go down, if the bolts were all in good condition, under a dull red heat?

A. I think it would.

Q. You think, then, that a crown-sheet of the character used in that locomotive, and with button-head bolts, would go down at a dull red heat?

A. Yes; with no water on it.

Q. The author of these experiments says that one of the most notable features, is the comparative slight degree of etc. (reading from page 995 of the work which has been referred to). Do you think that correct, or not?

A. I don't know.

[[677] Q. You have observed the look or iron which has been subjected to heat?

A. Yes.

Q. When it is heated a dull red and cools off, what is the appearance of the iron?

A. It has a bluish appearance.

Q. When it is heated to a bright red and cools off, what is its appearance?

A. It would be a little lighter blue.

Q. And when it is heated to a white heat and cools off, what color would it be?

A. I don't know what color it would be. I couldn't answer that.

Q. Would you, or would you not, expect to find that that side of the crown-sheet which had been next to the fire and heated to a white heat, would have a fluky appearance, like any iron that has been very hot?

A. This one didn't have that appearance.

Q. Then, in your opinion, it was not heated to a white heat?

A. No.

Q. If it had been, it would have presented a scaly appearance?

A. I think it would have been a little more rough.

[678] Q. What was the pressure on each one of these bolts,

when the boiler was to the popping-off point?

A. 185 pounds, and I think the bolts were spaced 4x4, and 16x185, that is 2,960 pounds.

Q. Then, the maximum pressure of the boiler on each of the bolts, is 2,960 pounds?

A. According to that calculation.

Q. You say there was a slight bagging in between the crown-bolts?

A. Yes.

Q. It was very slight?

A. Yes.

Q. It was not as much as you would have expected if the crown-sheet was heated to a good hot heat, anything like a white heat?

A. I don't think it would have gotten much hotter before it failed.

Q. Which side of the crown-sheet, to the right or left of the engineer, was the bulge?

A. On both sides of the crown-sheet. One side may have been more than the other.

Q. Do you recall which side was further over?

A. No.

Q. When the bolts are in good condition and three or four of them give away sufficiently to start the crown-sheet to going, that adds an increase of pressure on the other bolts and adds to the momentum which the sheet gets from starting to give. Isn't that true?

A. The pressure would decrease, too.

[679] Q. If enough of it gives away to cause the crown-sheet to give, it subjects the balance of the bolts to an increased pressure?

A. I don't think so, since, as soon as the pressure escapes, the pressure on the boiler would decrease.

Q. This author says, on page 998 of this work, that the strain of the letting go of a few bolts, throws such a pressure on the others, etc. Do you think that correct?

A. Not unless the heads were hot.

Q. I mean, the increased strain on the bolts?

A. It may be a little increased strain on the adjacent bolts. But the bolts on the back would not, unless the boiler pressure is increased.

Q. Isn't it true that the beginning of motion, in cases of that kind, causes a sort of leverage on the balance of the bolts adjacent, so

as to cause them to give away?

A. Yes, on the ones adjacent, but not on the back ones.

Q. And the more that give away, the stronger the pull is?

A. Yes, but the pressure is escaping, too.

Q. The action of steam is very quick?

A. Yes.

Q. I understand you to stay that the fact of that little ring being in the crown-sheet, under the button-head, would necessarily show that it was hot at the time of the giving away of the sheet. Is that your opinion?

A. I think it would show that the sheet was hot.

[680] Q. I show you here some illustrations of drawings made from the experiments to which I have referred, in some of which pressure on the bolts was exerted hot and some others cold, and ask you to state whether it does not say that in all of the cases the crown-sheet was very much distorted, when hot as well as cold?

A. The pressure exerts a tendency on the bolts to pull.

Q. Do not these drawings show that the evidence of that tendency was shown at the holes where the bolts are inserted, and also that the crown-sheet is distorted when it is cold as well as when it is hot?

A. Yes; if sufficient pressure is exerted.

Q. If defective bolts were to break, there would not be sufficient pressure to cause very great sagging?

A. Not one bolt.

Q. But the balance of the bolts would cause a depression?

A. I think so.

Q. Then, if the crown-sheet comes down, due to a defective bolt, or three or four defective bolts, close enough to one another to cause the explosion, increased pressure on the adjacent bolts would be sufficient to more or less distort the crown-sheet as they give away?

A. I don't think it would unless they were hot.

[681] Q. If they were good bolts and sufficient strain was imposed to make them break, would not that cause a depression?

A. Yes; if there was sufficient pressure, but I am speaking of ordinary working pressure.

Q. How many accidents or explosions have you ever examined since you have been with the government? Since that time?

A. I think about eight.

Q. How many of those did you report as in your opinion being caused by low water?

A. All of them.

Q. Have you ever seen an explosion which, in your opinion, was not caused by low water?

A. I had reference to the crown-sheet failures that caused explosions.

Q. Have you ever seen a crown-sheet failure that you didn't attribute it to low water?

A. Yes.

Q. What was the cause of that?

A. Not sufficiently braced.

Q. What was the matter?

A. Not a sufficient number of braces. It was stayed by crown bars.

Q. Then you never have known of any modern boilers to go down that you didn't think it was due to low water?

A. No.

[682] Q. And there is a general tendency, when a crown-sheet goes down, to attribute it to low water?

A. Not without making an examination.

Q. I want to know whether or not it is a fact that a large percent of the engines now in service have crown-sheets on them which have been overheated?

A. Not in this section of the country.

Q. Have you ever seen a locomotive with a crown-sheet that had been overheated?

A. Yes; I have seen several.

Q. How do you know it had been overheated?

A. Bagging between the bolts and bolts leaking.

Q. Have you seen one that was overheated and the bolts did not leak?

A. No.

Q. Have you ever seen any overheated and the bolts were corked?

A. Yes.

Q. Did that still present the same bagging appearance?

A. Yes.

Q. So far as you know, this crown-sheet may have been previously overheated?

A. I don't think so. All of the bolts we found did not present an appearance of being corked.

Q. How many bolts did you find?

A. We found several. We missed a good many of them, prob-

ably as many as nine-tenths.

Q. That is the only reason you have for saying they [683] never had been corked, because those you saw had not been?

A. None of them left in were corked.

Q. The bolts left in were the ones in the lower part of the crown-sheet and the ones less apt to be affected by low water?

A. Yes.

Q. What ones you would least expect to be corked in were not corked?

A. Yes.

Q. What are the advantages of button-head bolts, if any?

A. Some think them stronger and safer.

Q. Why?

A. There is more metal. There is thread to hold, besides the button-head.

Q. What are some of the disadvantages?

A. They draw a little more heat to that particular spot.

Q. What about the advantage of having them, in the construction of the boiler?

A. They are a little more expensive and a little more difficult to fit.

Q. What different procedure is used in fitting a button-head bolt, from any other kind of stay?

A. The button-head bolt is usually turned on a machine and screwed into the sheet from the fire box side. The ordinary bolt is only a straight piece of iron, cut on a bolt cutter, and screwed from the outside.

Q. What steps, if any, are taken, to fit the button-head [684] bolts against the crown-sheet?

A. Just turned in, until it is screwed in.

Q. That is all you know that is done in order to properly adjust a button-head bolt?

A. That is all I know of.

Q. Did you notice, from an examination of this crown-sheet, whether or not anything had been done, besides what you have said, to fit the button-head bolt to the crown-sheet on this engine?

A. I did not.

Q. You didn't see any evidence of anything else having been done?

A. No.

Q. You didn't notice that any part of the crown-sheet was cut away around the bolt head?

A. I didn't notice it.

Q. Well, that is right important, isn't it?

A. I don't think so.

Q. Isn't it true that unless your surface of the crown-sheet is perpendicular to the bolt, that there will be a strain one side more than the other?

A. If your bolts don't come up square, there may be.

Q. Isn't it necessary to shave off the surface of the crown-sheet around each bolt?

A. I have never seen anybody do it.

Q. The same author, at page 994, says: "The chief ob-
[685] jection to button-head bolts is the liability," etc. What do you know of any such practice as that?

A. I have heard of it, but never saw it done.

Q. Isn't it true that if the bolt is not perpendicular there will be a strain on one side that will cause it to twist?

A. Not if the threads were a good fit in the hole.

Q. That button-head bolt is much stronger than a bolt with no head on it?

A. Yes.

Q. Isn't it true that if it is not screwed in perpendicularly, the whole power of the bolt will be weakened?

A. Not if the threads is a good tight fit. Not unless the threads were a loose fit.

Q. What is the use of having a head?

A. Additional strength, in case the threads are a bad fit.

Q. In case one of these screws had weak threads, there would be a strain and probably the head would come off?

A. It would be a bad strain on the bolt head.

Q. When you observed this crown-sheet, you observed that the original scales left by the rolling process were on the sheet?

A. I can't answer that.

Q. Don't you know what that is?

A. I don't know that there were any scales on it.

[686] Q. Don't you know whether it had been materially changed from its condition when it left the rolling process?

A. I don't think it had.

Q. Isn't it true that when a perfect bolt in a crown-sheet is subjected to sufficient pressure to cause it to give away, whether hot or cold, it will, more or less, leave evidence on the crown-sheet, of a tendency to pull through?

A. I think it would.

Q. Because the holding power of the crown-sheet and the bolt are about the same?

A. Yes.

Q. But if a defective bolt gives away, then that perpendicular bolt would not leave much mark on the crown-sheet, if the head came off?

A. If it gave away inside, the head would remain in the sheet.

Q. If the head pulls off, it doesn't leave much mark on the crown-sheet?

A. I don't suppose so, if it was defective.

Q. When metal gets hot it expands?

A. Yes.

Q. But you can heat a crown-sheet without any water and not much pressure and not injure it, provided the bolts are properly adjusted?

A. Possibly, but the bolts would leak a little.

Q. You would not expect to find a leak, if they were properly adjusted?

A. No.

[687] Q. But, if one of the bolts was improperly adjusted, and it was heated, that would twist that bolt and possibly break it?

A. It might make it leak.

Q. It would break it too, would it not?

A. No, not always.

Q. It is perfectly possible for an engine to run along with ordinary pressure, with no heads on the bolts at all?

A. Yes.

Q. What reason do you give why this could only have been caused by low water, if any, or do you not think it was possible for it to have been caused from a defective bolt?

A. I don't think it was possible.

Q. Why?

A. The bolts were of sufficient strength to hold the crown-sheet up and one defective bolt would not cause the crown-sheet to come down. If they were all defective it would give away, I suppose.

Q. What about two or three being defective?

A. I don't think it would give away.

Q. Are you familiar with the requirements of the Interstate Commerce Commission?

A. Yes.

Q. What does that require? How many is the maximum number of stay-bolts, within close proximity to one another, they will

allow an engine to run with?

A. Three within a circle of five feet in diameter, two ad-
[688] joining, or five within the entire boiler.

Q. Then, if there were more than five, they would not allow it to be run?

A. No.

Q. Well, if it is not possible for it to break down from five defective bolts, why would they make such a foolish rule?

A. They want a margin of safety.

Q. Do you think it would be possible for it to break with three adjacent bolts?

A. Not in the condition that crown-sheet was in. There would be too much support from the other bolts.

Q. But if you inspected it you would have to put it out of service, because, under the rule, it was not safe?

A. Yes.

Q. You don't think it would be possible for three or four defective bolts to have been in the boiler in close proximity?

A. It could have been, but whether it was or not I do not know.

Q. You can't tell whether it occurred from defective bolts, or low water, can you?

A. From the inspection we made, we are satisfied it was from low water.

Q. You have not given me any reason why that boiler could not present the same appearance, if it was caused from defective bolts.

A. The sheet would not have the appearance it does.
[689] The color would not be the same and the threads wouldn't be in the same hole and they, if it was defective bolts, there might have been defects in the head or in the boiler, and if they were defective in the boiler they would still be in the boiler.

Q. If the defective head gave away, what would you expect?

A. I would not expect to find them clean and clear, as they were.

Q. What do you mean by that?

A. Nothing sticking in between the threads.

Q. None of the threads broken?

A. I don't think so.

Q. If they were broken, then that indicates there must have been a defective bolt?

A. Not necessarily. There might not have been any threads.

Q. There was either a defect in the bolt, or in the crown-sheet?

A. No, I didn't say so.

Q. Didn't you say that there was either a defective bolt, or because there was no threads in the crown-sheet?

A. I didn't say that.

A. If the boiler had been subjected to slight overheating prior to the time of the failure and any leak had been corked up, would it not have presented the same appearance?

A. I don't think so.

[690] Q. In what respect?

A. It would not have been of a fresh appearance.

Q. Suppose it occurred a day or so before?

A. The smoke and gas would have obliterated anything except the depression in the sheet, every possible sign.

Q. How does smoke get inside the boiler?

A. It gets in the fire box, not the boiler.

Q. How about the inside of it?

A. The scale and water formation inside the boiler would have hidden it.

Q. Then, the only reason why you think that there was difference between the appearance on the crown-sheet, as it was when you saw it, and as it would have been if it had been previously burned, was that you think the marks of a previous burning would have been obliterated?

A. Yes, that was what I said.

Q. Suppose the burning had occurred before leaving Roanoke, at a very low pressure, do you think the signs would have been obliterated?

A. It would not have been possible for them to get so far as that.

Q. Why?

A. The boiler would have leaked too bad.

Q. That is your opinion?

A. Yes.

[691] Q. That is the only reason you have?

A. Yes.

Q. If you have any others, give them to me.

A. That is all I have.

Q. That is the only reason you think it was caused by low water?

A. Yes; the appearance of the sheet.

RE-DIRECT EXAMINATION.

Q. What is the most common cause of these failures?

A. Low water.

Q. When the boiler is overheated does it injure the strength of the metal?

A. I would not think so.

Q. Did you ever investigate any other boiler explosion, where the engine exploded under the charge of Andrews?

A. I would not like to say about that.

Q. Was it A. W. Andrews?

A. I can't say about that.

Q. Mr. Staples has asked you some questions about the increased pressure on the boiler when two stay-bolts give away. You said the pressure would not be increased much because the steam would escape through the holes?

A. I said I thought possibly the pressure on the adjacent bolts might be increased, but not on the back ones.

Q. What would be the effect upon the boiler pressure?

[692] A. I think it would decrease the boiler pressure as soon as it began to escape.

Q. If three or four bolts near together were defective, it would not bag between these defective bolts, would it? It would make one big bag, wouldn't it?

A. I think so. The heads would have to hold to make it bag between the bolts.

Q. As a matter of fact, the crown-sheet has a very much harder metal than the stay-bolts, so that the stay-bolts, unless the crown-sheet was hot, would make no impression on the sheet?

A. It might do it under very severe strain.

The evidence of F. P. Pfahler read to the jury on October 9th, 1914.

[693] F. P. PFAHLER.

F. P. Pfahler, for Defendant:

DIRECT EXAMINATION.

By Mr. Hall:

Q. Mr. Pfahler, what are your initials?

A. F. P.

Q. Did you make an inspection of engine 469 on the Virginian Railway after the explosion which occurred to that engine?

A. Yes, sir; in company with Inspector Williams.

Q. When did you make that inspection?

A. On the Saturday and Sunday following the accident, which days, I think, were the 16th and 17th of November.

By Mr. Staples:

Q. Are you one of the Government inspectors?

A. Yes, sir.

By the Court:

Q. Did you make a report of your inspection of this particular engine?

A. Yes, sir.

Q. I see this says something about a chief inspector. Mr. Pfahler, are you the chief inspector?

A. No, sir; I am a district inspector.

By Mr. Hunt:

Q. Mr. Pfahler, have you examined your report recently?

A. Yes, sir; my note book only.

Q. Upon which your report was based?

A. Yes, sir.

Q. You had to do that to refresh your mind, I imagine?

A. Yes, sir.

Q. And without which of course you could not remember this case?

[694] A. Not the small dimensions, sir.

By Mr. Hall:

Q. I will now ask you to answer the question which I propounded to you when objection was made, which question will be read to you by the stenographer (the question is read as follows): "Q. What did that inspection show in reference to the condition of the crown-sheet?"

A. That it was damaged by overheating.

Q. What experience have you had in the inspection of boilers and in work in machine shops and doing work of boilermaker?

A. I have had twelve continuous years in railroad work. That is, I mean, in mechanical lines. I have never been a boilermaker, but I have been a draftsman, foreman; I have had several years experience as mechanical engineer, and since the 1st of November, 1911, a boiler inspector for the Government.

Q. Has your experience in the various lines of work you [695] have followed, enabled you to be able to say what the condi-

tion of a crown-sheet shows, or indicates, as to whether it has been heated with water on it or not?

A. I think so, sir.

Q. Have you examined that crown-sheet since it has been brought here?

A. For a minute, at noon today, after the court recessed.

Q. What is the size of the burned area on that crown-sheet?

A. I couldn't say exactly.

By the Court:

If you will state it approximately it will do, I imagine, for either side.

A. I think, but I am not exactly sure, that my examination showed the overheated area to extend on each side between the sixth and seventh rows of bolts from the flue-sheet, and from there to between the sixteenth and seventeenth rows of bolts from the flue-sheet.

By the Court:

Can you put that in feet and inches?

Witness:

Well, the bolts are spaced approximately 4x4 inches, and that would be about 48 inches by, say, 68 inches, or 4 feet by 5 feet and 8 inches.

Q. Could that crown-sheet have been burned so as to present the appearance that it did when you inspected it and that it now presents, if it had had water on top of it?

A. No, sir.

[696] Q. What are the indications on that crown-sheet showing that it was heated to this excessive heat without any water on it?

A. There are a number. First, there is the color, and the color of heated metal is characteristic. I mean by that, that its color is easily told. The bolts themselves were heated. And this color line ran up on the bolts on top of the crown-sheet for several inches. The sheet itself was soft, brought nearly to a plastic state; and there were plainly defined prints of bolt heads in many places on the inside or fire side of the sheet.

Q. Are the holes enlarged, or do they show their true size, as they did when the crown-sheet was in shape?

A. No, sir; some of them are elongated.

Q. Could they have been given that shape in any other way

than by the crown-sheet being heated and under this pressure?

A. No, not to my knowledge, sir.

Q. Are there any pockets in the sheet between those bolt holes?

A. Yes, sir.

Q. What do they indicate?

A. That the sheet was soft, and that it bagged between the bolts prior to the final rupture.

Q. Could there have been any water on the top of this sheet covering the burned area and the sheet have been forced into the condition that you have described?

A. I don't think so, sir.

[697] Q. If this sheet had been burned so as to be in the condition it now is, could that engine have hauled the train from Roanoke, a distance of 20 miles west of here?

A. I think not, sir. It would have leaked very badly.

Q. Why would it have leaked?

A. Because of the action of the heat, the intense heat such as the sheet was subject to, would have enlarged the holes in the sheet, tending to destroy the nice fit between the thread of the bolts and the thread of the sheet, and water would have escaped.

Q. Did you examine the injectors that were on this engine?

A. Yes, sir.

Q. What tests did you put them to?

A. We moved them onto locomotive 468, a locomotive of exactly the same class, and tried them under varying steam pressures.

Q. How did they work?

A. Satisfactorily, first-class, at steam pressures of 100, 150 and 180 pounds.

Q. Are you familiar with this type of injector that was on this engine, the Sellers' non-lifting injector?

A. Yes, sir.

Q. Is that one of the best makes of injectors that is used?

A. It is a standard injector; yes, sir.

[698] Q. Is it in general use?

A. Yes, sir.

Q. Did you examine the water glass?

A. Yes, sir.

Q. What did that show?

A. We found no defects in the water glass. We found it O. K.

Q. Did you examine the guage cocks?

A. Yes, sir.

Q. What condition were they in?

A. Operative, properly handled. The openings into the boiler were clear.

Q. What was the condition of that engine, Mr. Pfahler, outside of this broken crown-sheet; I mean, as far as you inspected it, what was its condition and the condition of all its appliances that would in any way enter into an explosion of that kind?

A. Absolutely perfect, as far as our inspection went.

CROSS-EXAMINATION.

By Mr. Hunt:

Q. Mr. Pfahler, you say you tried these injectors and they worked without any difficulty?

A. Yes, sir.

Q. Even under 100 pounds pressure?

A. Yes, sir.

[699] Q. If the valve-seat was opened, where would that throw the water?

A. Ordinarily it would deliver it through the check into the boiler.

Q. If it is in perfect condition there is no reason why it shouldn't, is there?

A. No, none that I know of.

Q. Can an engineer sit in his engine and tell whether his injector is working?

A. Ordinarily; yes, sir.

Q. There is no reason why he cannot, is there?

A. No, sir. If the injector were to "break", the water would be discharged from the overflow, in that class of locomotive.

Q. And he could tell it instantly, couldn't he?

A. He could tell it; yes, sir.

Q. Whether or not it is a dark night, wouldn't cut any figure, would it?

A. I wouldn't think so.

Q. It is a recognized fact among railroads that crown-sheets are often burned under differing conditions, isn't it?

A. Yes, sir.

[700] Q. I suppose you, like every other man who has had experience like you have had, has seen them burned in the roundhouse, and in the yard, and at different places?

A. I have never seen one burned in a roundhouse.

Q. You never have?

A. No, sir.

Q. There is no reason why it should not?

A. There is no reason why it could not.

Q. You often bring them into the shops when they are burned, don't you? When you find an engine burned out in service, what do you do with it?

A. That would depend, ordinarily, if it were a bad burn, one that in my opinion would make the locomotive in any particular unsafe, then we would order it shopped and proper repairs made.

Q. You would send her right into the shop as soon as you discovered the burn?

A. Yes, sir; ordinarily.

Q. You do that for what purpose?

A. To make it safe.

Q. So as to be safe for the engineer to run it?

A. Yes, sir.

Q. When a crown-sheet gets burned, or at the time it is burned, I suppose it is physically impossible for anybody except the one higher up to tell the time when it did get burned?

[701] A. I couldn't answer that question.

Q. Certainly you never have gone that far up, have you?

A. No, sir.

Q. As to whether it got burned on one trip or on two trips before the time in question, or a week before, or a month, or whatever time it was before the date when it gave way, is not indicated by the burn, is it? It cannot be, can it?

A. I don't think I quite understand your question.

Q. I mean as to the time that the burning occurs. For instance, if a crown-sheet was burned on yesterday, and burned badly enough so that if you were to discover it you would think it safer to send it into the roundhouse for repairs, you couldn't look at the crown-sheet and tell when it was burned?

A. No, sir.

Q. And no living man could tell it?

A. I don't think so.

Q. That which causes the crown-sheet to sag is the steam pressure on it, isn't it?

A. It is a matter of two things, really. First of all, it is the pressure that causes the crown-sheet to sag; and secondly, the sheet itself is then structurally weak. Under the heating it gets soft, plastic.

Q. That is what I am coming to. Whenever a crown-
[702] sheet is burned, its usefulness is impaired, necessarily, isn't it?

A. Yes, sir.

Q. It becomes weaker than it was, doesn't it?

A. (Witness bows his head.)

Q. That is self-evident?

A. Well, ordinarily, a sheet in the process of manufacture may have been put through heat which is as intense and just as severe as it may be, we will say, in a case of this kind.

Q. You have got to put them through a white heat in order to roll them?

A. To flange them; yes, sir.

Q. I mean if after that time it shows it to be in marketable condition, but after it is put on the engine it receives a burn, the inevitable effect of the burn is to impair its usefulness and strength, is it not?

A. That would depend on a great many conditions.

Q. Well, can you hardly imagine a condition wherein if a crown-sheet was burned and burned badly enough for you to see it and think there might be danger connected with it, enough to send it into the shop, that you wouldn't do it because you thought its strength and usefulness were impaired to some extent?

A. Not so much of the sheet as of the stays.

Q. As of the stays?

A. Yes, sir.

Q. Then, the stays which are in the sheet would be suffestive of impaired usefulness? That is true, isn't it?

A. Yes, sir.

Q. And it is for that reason when it is burned with pressure on it, it will be caused to get out of shape?

A. Yes, sir.

Q. Now, tell the jury, in a case of an engine carrying
[703] 185 pounds of steam pressure, how many pounds that is to every square inch on that crown-sheet?

A. 185 pounds.

Q. On a crown-sheet of the size of that—and I believe that exhibit out there is just one-half of it—can you give the jury the pounds pressure there would be on that sheet? It would take a mighty long piece of paper to calculate that, wouldn't it?

A. No; it could be reduced to square inches, and the square inches multiplied by the pressure per square inch.

Q. Mr. Pfahler, which is the simplest injector, in the matter of operation, the lifting or non-lifting?

A. The non-lifting.

Q. That injector which you see there is the simplest injector for the engineer to operate, isn't it?

A. It is simpler in its construction.

Q. As well as in its operation?

A. No; it is not as simple of operation as the lifting injector, that is, as the average lifting injector.

[704] Q. The only thing you have to do with this one is to throw your valves open and apply your steam; but your valve must be properly opened, must it not?

A. To set this injector to work, you must open your overflow; assuming that your water valve remains open, and supplies steam through what is known as a starting valve, a lever-handled valve, located close to the engineer in the cab.

Q. Yes, sir. I understand you to say that when the water valve is opened and then with your application of steam the water must go into the boiler, do you?

A. If properly operated; yes, sir.

Q. Then this injector is the most certain in the matter of its action and the consequences, of any injector that you know of, isn't it?

A. I wouldn't like to say that, but that is a standard injector.

Q. I don't mean for you to discriminate between the different types of patented injectors. I am simply trying to get the information for the jury as to which, if you were an engineer, you would regard as the easiest for you to work, and surest of results?

A. Yes, sir.

Q. That injector there?

A. The non-lifting; yes, sir, generally speaking.

Q. I understand you to say, then, as to attempting to say when this crown-sheet was burned, you wouldn't undertake to say?

A. I cannot say.

[705] Q. Whether before or after—certainly not after the accident, of course, but how long before the accident, you don't know?

A. No, sir.

Q. And no living man can tell?

A. No, sir.

Q. Stand aside.

By the Court:

I want to understand distinctly whether or not it is your opinion that that particular crown-sheet could not have been in the condition in which we now see it, except that it had fire on the under side with no water on the upper side?

Witness:

I firmly believe that, sir.

Mr. Hunt, continuing:

Q. But, as to what time, whether on this trip, or on the previous trip, no living man can tell?

A. The water was off that sheet at the time of the failure, certainly; it must have been.

Q. Now, then, Mr. Pfahler, if the water glass—well, I will make the question read on a .9 of a 1 per cent grade?

A. I cannot answer that question. I know nothing at all of the local conditions.

Q. Well, you say you have run engines?

A. No, sir.

Q. You never have run an engine?

A. No, sir.

Q. Then you do not know how long the water would last?

A. I cannot say; no, sir; not having had any experience [706] with it, and not knowing all of the local conditions.

Q. But you do tell the jury that a burned crown-sheet has a decided tendency to weaken the bolts which hold the sheet, regardless of the time when the burning occurred?

A. I believe that; yes, sir.

Q. As to whether the injectors and the glass guage were in the same condition at the time of the accident that they were when you found them, of course, you could not tell that?

A. I cannot tell that.

Q. You only know what they were when you got there?

A. Yes, sir.

Q. That is all.

RE-EXAMINATION.

By Mr. Hall:

Q. What are the indications on that sheet that the water was off of it at the time of the failure?

A. There are the prints of the bolt heads on the fire side of the sheet, which show that the sheet was soft, and approaching a plastic state. And there is the distinctive color which comes on a sheet, or on any piece of metal, which has been overheated.

[707] Q. Do those signs show unmistakably that the water was off the sheet at the time of the failure?

A. Yes, sir.

Q. You stated that heat weakened these bolts. Did you mean at the time that they are under the heat, or after the heat goes away and the water is put back on them and they are cooled off?

A. I meant, sir, that under heat, sufficiently intense heat, the bolt heads themselves become very hot and soft, and that in that condition they are really plastic, soft, and are liable to pull off.

Q. Now, when they are cooled, do they regain their original strength?

A. That would depend on the degree of over-heat, but ordinarily they would, probably.

Q. That is all.

RE-CROSS-EXAMINATION.

By Mr. Hunt:

Q. Heat has a tendency to expand?

A. Yes, sir.

Q. And cold contract?

A. Yes, sir.

A. A crown-sheet which might be leaking under cold

[707a] conditions would be checked by heat, or the heating of it would check it, wouldn't it?

A. I am not real sure of that.

Q. Well, the heating certainly expands and stops slight holes, does it not?

A. I have found that heat evaporated the water and that a leak was not visible, or perceptible, but that it was there just the same.

Q. Taking this other theory, of expansion by heat and contraction by cold. Isn't it a fact which you gentlemen of science recognize, that you can heat iron until it will stop a leak, just like you would by soaking a piece of wood until it would expand and stop a leak? Isn't that true?

A. I cannot answer that of my own knowledge.

Q. That is all.

(Witness leaves the stand.)

Court adjourn until tomorrow morning, Saturday, October the 10th, 1914, 9 a. m.

OCTOBER 10, 1914, 9 A. M.—MORNING SESSION.

Continuation of the evidence on behalf of the Defendant:

[708] S. H. LEWIS, RECALLED.

S. H. Lewis, recalled, for Defendant:

DIRECT EXAMINATION.

By Mr. Hall:

Q. Were you connected with the Virginian Railway during the whole time Mr. Andrews was employed by the railway company?

A. Yes, sir; I employed him and he was killed before I left the service.

Q. I wish you would state to the jury whether or not he worked regularly?

A. He reported sick on a good many occasions.

Q. You have examined these bolts that came out of this engine, haven't you?

A. Yes, sir; I have seen them a good many times.

Q. You will notice that most of these bolt heads are broken down into the head—

Q. I wish you would please state to the jury whether or not that concave appearance of the bolt head, that is, being broken down into the bolt head, indicates whether it was broken hot or cold?

A. You mean what does that indicate?

Q. As to whether it was hot or cold, that is, whether the [709] sheet had water on top of it at the time it was broken or not?

A. The indication is it was hot at the time it broke, that the middle was weaker on account of the heat there and caused it to pull out in that way.

Q. If the bolt head had been broken cold at that point, where would it have broken?

A. It would have broken square across.

Q. Why?

A. I have seen bolt heads that were pulled off, straight square off, because the cross-sectional area is less than it would be if they were pulled down under the head that way, less metal.

Q. In other words, there is less material to pull it straight across than to break it down under the head that way?

A. Yes, sir.

CROSS-EXAMINATION.

By Mr. Hunt:

Q. You are talking about a bolt that is not defective, aren't you?

A. What do you mean?

Q. A good bolt.

A. Yes, sir; I am talking of course about a good bolt.

Q. If the bolt had been defective the break would take the same grain with the bad part?

A. If the bolt was defective the metal would not be of [710] equal strength all the way there.

Q. It would follow the line of least resistance?

A. Yes, sir.

RE-EXAMINATION.

By Mr. Hall:

Q. If some of the bolts had been defective or if they had been made of defective material, would they all have broken down into the head like these are broken?

A. It is not likely they would all have been defective in the same respect and in the same way.

RE-CROSS-EXAMINATION.

By Mr. Staples:

Q. If one of those tests up there of those sixteen long rods out of which these bolts were made, happened to have been omitted or carelessly made and the whole sixteen long strips were defective, how many defective bolts would that put into the crown-sheet of your engine, do you know? In other words, I want to know how many bolts would have been in those strips.

Defendant objected. Overruled. Exception.

A. I believe from long experience in testing material that if they found that percentage in the total number of bolts used it would be sufficient to tell whether the material was good or bad.

Q. Please read the question again.

[711] (Question is again read to the witness.)

A. It would be pretty hard to say, because those strips were stated to vary anywhere from 12 to 16 feet in length.

Q. 16 to 20

A. I thought it was 12 to 16; whatever it was, there was a variation in the length and then the bolts vary in length, the bolts ran anywhere from, say, 8 inches to 18 inches, that is through the side sheets and crown-sheet, so it would be pretty hard to say just how many bolts would be in the bundle.

Q. You would have 300 feet of strips approximately in one bundle?

A. Then there would be 300 feet of bolts except what they would lose from cutting off; I couldn't say the number of bolts, because the bolts vary in length considerably.

Q. Would that or not make in the neighborhood of from 100 to 150 bolts?

A. If you average the bolts at one foot in length, 300 would be 300 bolts.

(Witness stands aside.)

[712] JOHN DOARNBERGER.

John Doarnberger, sworn, for Defendant:

DIRECT EXAMINATION.

By Mr. Hall:

Q. What line of work do you follow?

A. I am the master boilermaker of the Norfolk & Western Railway Company.

Q. How long have you been engaged in work as a boilermaker or as a master boilermaker?

A. I have been engaged in boilermaking for thirty-one years and for the past twenty years foreman , and for the last ten years as master boilermaker.

Q. Have you had charge, as master boilermaker, of all the boilers of the engines that are run on the Norfolk & Western?

A. That is, I have charge of the boiler work and also the men engaged on the repairing and building of locomotive boilers.

Q. Have you had any experience in examining boilers that failed from low water.

A. Yes, sir.

Q. Have you had any experience in examining crown-sheets that have been overheated from low water?

A. Yes, sir.

Q. That did not fail?

A. Yes, sir.

Q. How many have you seen and examined in the last thirty years?

A. Well, now, up to, say 1901, I never kept any record,
[713] in the last, probably twelve years, I have examined probably from 29 to 30 cases.

Q. Did you make any examination of the boiler of this engine, 469, of the Virginian Railway Company after the failure?

A. Yes, sir.

Q. When and where did you make that examination?

A. I made my inspection on Tuesday, November the 19th, 1912, and the time of my inspection was made at 11 a. m.

Q. At what place?

A. I found the engine in the last stall in the West End erecting shop, I call it west; anyway, it was the last stall in the erecting shop of the Princeton shop of the Virginian Railroad.

Q. What caused that crown-sheet to go down?

A. An insufficient amount of water.

Q. Or lack of water on the crown-sheet?

A. Yes, sir.

Q. When was there that lack of water on the crown-sheet?

A. It was at the point of failure.

Q. With reference to the explosion that blew it down; in other words, did the crown-sheet have water on it when it was blown down?

A. No, sir; it did not.

Q. What indications were there that that crown-sheet was blown down without water on top of it?

A. When I entered the fire box my attention was attracted to the peculiar condition in which the sheet had given way, and come down, the depth of it I believe was ten and three-quarter inches at the lowest point. After examining the sheet very closely I could readily distinguish the line of demarcation, that is, what is known as
[714] the low water line; I can follow it around the plate, it was very pronounced. I could notice the difference between the coloring of the sheet, which is blue inside on the part that was uncovered, and the ordinary surface rust, that is, the surface rust was black, and the ordinary surface rust between the inside color and the ordinary surface rust that was on the fire side of the sheet. After I

went down through the dome and crawled back and made an internal examination, this was on the inside of the boiler, and I noticed very clearly as I followed it around the sediment, or in other words, the incrustants that adhered to the sheet by the boiling of the water, that was removed, it was taken from the sheet. And the only way that could be taken from the sheet without being scraped off by a sharp instrument would be by heat, and it would have to be excessive heat to remove that.

Q. Was that line of demarcation on both the outside and the inside of that crown-sheet plain at that time?

A. It was very pronounced on both sides.

Q. Can you follow that line now on this sheet?

A. I believe I can. The sheet right now is obliterated somewhat, but I believe I can go right there now and follow right along. If I had a piece of chalk or something I could pick the line out for you.

[715]

Q. I wish you would take a piece of chalk and go over there and mark the color line on both sides of it, the fire side and the upper side, and I will ask the jury to go over there and see the line as you put it on there.

(The witness and jury go to the crown-sheet in the courtroom, where the witness makes a chalk line around it.)

A. I would just like to say—one minute in making this line. I do not say I am going to be as positive with this as you would make a line like that (indicating), because the fluctuation of the water movement in the boiler would probably make it vary a little bit. I don't mean now that I am going to pick the line out just like you would draw a line on a piece of paper with a pencil, but I am going to follow the line around (witness does so with a piece of chalk). Now, that is the low water line on the fire box side. This up here is the left side, and that is the right hand side; that is the back and this is what we call the front; this is where it was fastened to the flange like that (indicating); this is the flue-sheet, that is bent that way; this sheet lays on top of it there, and that sheet is riveted to it and it is caught here and caught here to hold it tight after riveting. You see that impression there, this is the back and when this sheet turns up we stand back there and I turn this sheet over like this, and this makes it the left hand side and this the right hand side, and this is next to the fire box.

Q. Now, please point out to the jury what the difference is between the burned area and the part not burned.

A. Well, you start in there; you can see that blueish cast on there; this is not as clear as when I was in the boiler on the 19th of November; but you can see it brownish there; it commences to get darker there and this little redness has taken place by atmos-
[716] pheric rust; it has been well preserved to have it as good as it is. You can see this blackness here, that is what is known as ordinary surface rust; you can see the difference in the color; that is black, and goes on back and passes down there and gets black again, and then you catch the blue oxide. Then you can notice those heads there beyond the bag along there, it is very pronounced. Now, there is more bolts out of that sheet than when I was there. These bolts here have been taken out, I believe, since I was there, because there was twelve rows to this. Call this the center line of the boiler, there ought to be sixteen rows on either side of the center, making twelve rows in all. Now, these bolts is what is known as hammer-head bolts, screwed in and hammered in with a hammer; these are button-head bolts. I do not say I can pick every one, but there is a bolt that was not defective, it was good, and we will mark that with a "G".

Q. It was good when you examined it?

A. That was good. I do not say I can pick every one, but I believe that this bolt here was fair, that is, what I mean by fair, it was slightly pulled; I will mark this "F". I do not say I am going to get every one, but if I am not mistaken that bolt was in at the time, and I will mark that fair; it was slightly pulled. Now, I will
[717] mark these here with an "F" on it, the same as the hammer-head radial stay-bolts that were in. That bolt was fair, and I will mark it fair; I do not think it was out, I am pretty sure it was not; that bolt was good and I will mark it "G". That bolt was slightly pulled and I will mark it "F". That one, I believe—it is mighty hard to pick every one, but I will mark it "F". I believe that bolt was slightly pulled and I will mark it "F", and the next one and the next one was fair. Now then, all the bolts in the back right-hand corner have been removed, I believe, since the sheet was taken out; that is, on the outside of my line encircling the low water mark, all the hammer-head radial bolts along the lower row outside of my line were removed after making my test. The right front corner bolt was good, and I will mark it with a "G"; the one back of that and the one on top of that I will mark "F", which was fair. That is about as well as I can go on that now.

Q. I wish you would tell the jury while you are on this side,

whether the water line extended an equal distance from the center on both sides?

A. Yes, sir; it was very equally distribuated, uniformly
[718] on either side of the center.

Q. If the failure had been due from any other cause but low water, would it have followed such a distinct line as that?

A. No, sir; if it had been caused from anything else but low water it would have been more confined; that is, it would have been local, there would have been a local condition.

Q. Now go to the other side of the sheet and point out the line there and tell the jury how you distinguish that line now?

A. I am going to explain as I go along. You can see that bluish oxide on there. There you can see the scale adhering to the sheet or the incrustants; you can still see it; you can still notice that; you can still see it there; you can follow it right along there; you can still see it up there (witness indicating with a piece of chalk on the crown-sheet); you can notice it along there, it is very good there; you can see the difference between here and there, where it is yet adhering to the sheet; you can see it here very clearly; I will keep on down, I think I can catch it, though I will not be positive. Now it comes right along here; you notice the difference in here; you can see the scale here; I can feel it, you see (indicating). Now, you notice a little in front there; now, while that was the highest part of the boiler, yet it was not the hottest part.

Q. Why wasn't it the hottest part?

[719] A. I will have to take a piece of paper and explain that.

Q. Can you do it by making a diagram, or would you rather have a blackboard?

A. I would sooner have the blackboard.

Q. Now, I will ask you whether or not at the time you made this examination or immediately afterward, if you made a diagram showing the burned area of that crown-sheet?

A. While I was in the fire box I made my pencil sketches with my pencil on a piece of paper; after I made my sketches I taken them like these notes, to my office, to my drawing room boy and had him draw it for me, and then I went over it to see that it was correct. I got him to trace it for me, but I really made the sketch and he lined these in for me.

Q. Is that a correct diagram which you have in your hand and which I will ask the stenographer to mark Exhibit No. H?

A. Yes, sir; and I will file it as Exhibit H.

Q. I will ask you whether or not that is a correct diagram showing the burned area on that crown-sheet, made at the time of your examination on the 19th of November?

A. Yes, sir.

Q. Does that follow that water line as shown by your diagram or is that water line shown by your diagram indicated in red on your map?

A. Yes, sir.

Q. Was the whole face of that crown-sheet that is shown
[720] in red the uncovered area or overheated area of the crown-sheet?

A. It was the overheated area, the uncovered area.

Q. Was that area bare of water when the crown-sheet failed?

A. Yes, sir.

Q. You have indicated on that sheet how the bolt heads that were broken are shown?

A. Yes, sir.

Q. I wish you would just tell the jury what the round bolt heads indicate and what the square one indicate.

A. These marks or these lines here denote the button-head radial stays broken off under the head, that is, the ones broken off under the head; that one there and this over here. We will start on this first lime; there is one there, there, there, there, and so on as you come up and go down, backwards and forwards clean through; that represents the ones that were broken off under the head as you see them on the table.

Q. Were all of them broken that way under the head as you see those on the table?

A. All they had there in the box that I examined.

Q. I mean the stay-bolts were still in there, the broken stay-bolts?

A. This lot (indicating) remained there intact.

Q. They were all broken in the head but they showed they were broken?

A. All I have got marked were broken under the head;
[721] that I could tell by the long bolt that remained intact in the outer roof sheet.

Q. Were any broken in the body or anywhere else except in the head?

A. They were all broken under the head, immediately under the head close up to the fire side of the sheet.

Q. What do the square bolt heads indicate on your diagram?

A. The square button-head radial stays slightly pulled but not broken; I mean by that they were bent and twisted, distorted a little bit but not broken; these all along here (indicating); you can notice when it comes to the lower end of the water line that some of them—those two are what are known as the flexible bolts and these are the extension bolts, and these were like those, they followed the outside, you will notice, and they were ruptured to an extent.

Q. Were all of those bolts that were not completely broken off under the heads along the water line, were they located along the water line?

A. Yes, sir; all along.

Q. Were any located at all in the center or any part of the arch?

A. No, sir.

Q. What does that indicate?

A. It indicates that as the water went down to the water line that it was slightly cooler and that the bolts remained slightly ruptured.

Q. Is there anything else you want to point out by the [722] sheet?

A. I would just like to say this, that (indicating) is the open circle of the button-head bolts, heads of radial stays denote the button-head radial stays in good condition. I want to point out that bolt and that bolt (indicating) inside the low water line, and that bolt and that one (indicating) I found they were in good condition. Now, the bolts enclosed by the dotted line are of the Tate flexible; that portion painted red (indicating) shows where the sheet was heated, and what I mean in here is there is a dotted line around there, Tate flexible; this bolt having a head on it, the same as this did, which screws up and goes in a bushing, after which there is a nut that goes over it, known as the cap. There are four rows of those across the boiler, or 48, and that gives the flue-sheet a chance to contract and expand.

Q. Now, take the diagram and see how close you have run the water line on the sheet?

A. (Witness does so.) I haven't seen this sheet only at Roanoke and since I have been here.

Q. Now come here to the blackboard and show us which was the hottest part of the crown-sheet. You said that it wasn't the part that was uncovered the longest?

A. (Witness does so.) This is called the water space in here: this is the back door sheet of the fire box, and this (indicating) is the

back head; here is where they threw the coal in the fire box, and this is the crown-sheet (indicating). You will notice that this crown has got a drop, I think it is four inches, if I am not mistaken, from here to here (indicating). Now, that is the drop of the crown and here is the bottom and here is the bottom, say, of the last flue, that
[723] flue starts in there and the gases pass on out through the smoke box and stack. Right under here (indicating) there is three holes drilled across, say, this way (indicating), and up here there are bolts. Now, there is a pipe, what is called the arch pipe, that goes on down into that boiler, and there is three of these arch pipes, looking at them in this way (indicating) . I will show you this boiler in a shape like this (indicating), and here is the hole in which the pipe enters at this point in there (indicating). This is a screw plug in here, that you take out between it, on this (indicating) there is a brick arch, it lays on the pipe in sections, I don't know how many sections there were in this particular boiler. Now, this brick arch extends in sections through here (indicating) and it is laid on there like that (indicating). Now, then, when he is firing his boiler down here (indicating), here (indicating) is his fire. Now, as he forces the boiler, the gases are returning there, it cannot get up here, and the fire goes back and impinges against the crown-sheet there (indicating), and as you strike there (indicating) the gases drop forward and go through the flues there (indicating), therefore this sheet between there and here (indicating) is the hottest part and this is the coldest point and yet it is at the highest point.

Q. Does that sheet show it was burned most at the hottest
[724] point where the flames were hitting it?

A. Yes, sir; it is very clear.

Q. And is there (indicating) where the greatest bagging is?

A. Yes, sir; the demarcation shows that and the marking of the sheet.

Q. I will ask you to look at those stay-bolt holes and examine the threads in them and say whether the threads are there or not, left in the hole?

A. Yes, sir; they are very good with the exception of the lower hole; the holes in each of the front corners elongated.

Q. If that crown-sheet had failed with water on top of it, would those threads have been in that condition, if the crown-sheet had been cold, would those threads have been in that condition they are now?

A. If the sheet would have failed cold?

Q. Yes.

A. No; the threads would have been stripped.

Q. When you were over there at the sheet you said that certain of those bolts were defective. What do you mean by that?

A. The ones that I have got in my diagram marked that way (indicating) were what is known as slightly ruptured, but not broken off.

Q. What caused that defect in the bolt?

[725] A. It was where the downward movement of the crown-sheet had stopped, and did not take that portion of the head with it.

Q. Was the bolt head hot when that defect was caused?

A. Oh, yes, sir; but not as hot as the others about it.

Q. Does the appearance of these bolt heads, the way they are broken and their color, indicate anything to you as to whether that crown-sheet was cold, that is, had water on top of it, or whether it was uncovered and hot at the time of the failure?

A. Now, I do not know where these came out of, at what location of the sheet; but the bolts marked with a center punch, No. 10, No. 2, the figure 9, No. 6, No. 3 and No. 11, and 10 and 1, were the hottest of the thirteen bolts before me; bolts No. 4, 7, 8, 12 and 5 were the coolest of the thirteen.

Q. Why do you say that the bolts you have picked out were the hottest and the others the coolest?

A. My reason for that is, that the bolts, most of them, not all, have a greater bend, they are also drugged out down in the body of the bolt, or in other words, the fibers are torn more. The other side being the coolest, due to the fact that the drag-out of the head of the bolt was not as great as in the others.

Q. Can you break a bolt and tear it out down in the head

[726] like those that you have picked out as the hottest, when it is cool, that is, as cool as it would be in the crown-sheet with water on top of it?

A. No, sir; you couldn't tear the bolt like that, you could not break it off under the head and tear it that way.

Q. Why not?

A. From the simple fact that the head of that bolt is three-sixteenths of an inch larger in diameter or has a larger section than the body of the bolt, which is only an inch.

Q. Have you ever tried that to see whether it would break that way?

A. Yes, sir.

Q. When?

A. Now, it was—I made the inspection with Mr. Slayton and

one of the Federal inspectors, and it was after the blow-down crown-sheet in engine 1136, if I remember rightly.

Q. On what road?

A. The Norfolk & Western, near Thaxton; I think it was in March, and in April we got together and we wanted to see the condition of the bolts that had been in service for any length of time to see what the appearance would be, after we broke the bolt, after the discoloring of the bolt; so I got a lot of old bolts out of the engine, I think it was 247, and I looked up the record and I found out that we put that fire box in somewhere in February, 1900; I am not
[727] positive about that, either 1900 or 1901; anyhow it was in twelve years. So I took some of those bolts and picked them up and went to the laboratory and we pulled them after seeing twelve years of service; we done it to satisfy ourselves and to get in line as to the difference between a bolt that has been in service from one to twelve years under actual conditions, and one that had been blown out, to see the difference.

Q. Have you got that bolt here?

A. Yes, sir.

Q. How does a bolt like that pull when it is cold?

By the Court:

Like which?

Q. A crown-sheet bolt like the ones we are talking about.

A. Like these?

Q. Yes, sir.

A. You put them in and pull them, you will have a tight hole, a hole like they were screwed in, or you will give them a little play when you pull them, they will break off in the body, the long part of the bolt.

Q. And what would you have to do to break them off at the head?

A. The only way you can break them at the head is to
[728] nick them or reduce them down to the area of the body or something else like that and then pull them.

Q. And when you do that do they break clear across or down in the head, like these broke?

A. No; when you bring them down to the diameter of the bolt, nick them or saw them to that, and you get them to break there; they will break straight across with a clean fiber and a light appearance.

Q. Professor Randolph mentioned a crown-sheet that he saw

blown out on the side of the railroad in passing down by the Alleghany tunnel when he was passing on a train. Was that a blown up crown-sheet?

A. That was a blown down crown-sheet.

Q. From what cause?

A. Low water.

Q. Have you got one of the heads of the bolts that came out of that crown-sheet?

A. Yes, sir.

Q. I wish you would produce it and show it to the jury and show the shape of the bolt head.

Q. How did the bolts on that blown down crown-sheet break? Did they break down in the head like these, or square off, or some other way?

[729] Q. Now, I want to ask another question. Please state from your experience in examining blown down crown-sheets which failed from having low water on top of them, how the bolts in all of such crown-sheets were broken; that is, whether they were broken down into the heads of the bolts like the ones before you, which you picked out as being the hottest, or not?

By Mr. Staples:

We have no objection to that.

A. Yes, sir; all boilers that I ever examined, radial stay tight boilers [illegible] examined and that were blown down on account of low water, the heads in every case showed up as the hottest ones as I have just previously pointed out.

Q. Is there any corrugation or pocketing of this crown-sheet between the stay-bolts in the burned area?

A. Yes, sir.

Q. Was that greater or less just prior to the time of the failure than it shows now on the sheet?

A. From the condition of the bolts before the sheet failed and went down, the corrugation was greater than it is now.

Q. Why?

[730] A. When the sheet let go and went down it took it out by a stretch, by the bag buckling, as you call it; I call it corrugation. It took that out with the exception of the two front corners here.

Q. Did you see the diagram that was produced here yesterday and offered in evidence while Mr. Slayton was on the stand, showing

the red line there on the diagram which indicated the corrugation?

A. I just noticed it as they were holding it back and forth here.

Q. Have you ever seen crown-sheets that were not burned actually to the point of failure show those corrugations?

A. In a radial stay tight boiler; yes, sir.

Q. When a crown-sheet is burned to the extent that this one was, as shown by those corrugations, I wish you would tell the jury whether or not it is possible to operate the engine with such a crown-sheet in it?

A. I did not just get that question.

Q. Read the question, please.

(Question is here read to the witness.)

A. As shown by the corrugations on this sheet?

Q. As they must have been before it was forced down.

A. I will have to answer that question in this way; that
[731] is, the water went down, the sheet started to heat and as it did, on all my examinations of boilers, prior to one getting in this condition, along the furrow, that is through that sheet that way (indicating), that is the weakest part of that sheet. The strongest part of that sheet is over the arch, this way (indicating), in between those four bolts at the center four bolts is the biggest area. Now, as it heats that sheet kept coming down and down and down like that (indicating), in between those bolts, the bolts and each one is holding it up and that is sagging, sagging, sagging. If I wanted to bend that sheet, take it this way and double it over (indicating), the first place that that sheet would bend would be through the line of holes because it is the weakest point of the metal that has been taken out. If I want to bend it back this way it would be impossible to do it on account of the arch. In other words—if you will permit me—I will explain it this way. If you take a little stick an inch by an inch and lay it from here to here (indicating) and step on it, you would break it, but if you take that stick and put it in a camber, and fasten it at each end you can stand on it; you see, that is the principle of that, the pressure comes on, the water is going down, and it will withstand the possible, but it will not withstand the impossible, and as it comes down it goes down all at once, it comes to a point of failure and lets go, altogether, it takes that corrugation out and leaves the heads in that position as it drops.

Q. With that corrugation in there as it was just before
[732] it failed, could that engine have been operated in service?

A. No.

Q. Why not?

A. Not if they were to catch it before the point of failure.

Q. Suppose they caught it just before the point of failure?

A. It could not have been operated without having attention.

Q. Why not?

A. In the first place, if it got to a point just before the point of failure, the bolts would have leaked to such an extent, the sheet would have expanded, you understand, and loosen the bolts in the holes and leak to such an extent that you could not generate steam.

Q. Do burned crown-sheet bolts that when they are burned as much as the corrugation on this one indicates it was burned, always leak?

A. Yes, sir.

Q. Is there any way of stopping them without taking them to the shop and plugging the holes or doing something to them or rolling them out?

A. No; not after they have once gotten to a point or to where they got in the condition this was prior to the drop down, they generally shop them; you have to do it.

[733] Q. I wish you would look at those bolt heads and compare them with the bolt heads in their normal condition, the shoulders of them, and tell the jury whether or not those bolt heads could have been put in that shape with water on top of the crown-sheet?

A. No, sir; those bolts could not have been put in that shape; that bolt is a little larger in the body than this (indicating), but that bolt could never have been put in that condition with water on the crown-sheet. This bolt (indicating) would never have been put in that condition with water on the crown-sheet.

Q. Why?

A. If it would be allowed sufficiently to break that bolt cold, the bolt would never convex that way, it would break in the body. You take that bolt now (indicating) and put it in a bent sheet like that and pull it before it was convexed that way, you might have a little spot there and there (indicating), but it will break in the body before it does here (indicating).

Q. Here are two stay-bolts marked 6 and 8, that were pulled cold in a sheet until the bolts broke in the body of the bolts. I wish you would examine them and see whether they are convexed on the shoulder like the bolts that come out of this engine 469.

A. May I see the plates that they were pulled in?

Q. Here they are (handing same to witness).

A. That is a three-eighths of an inch plate, isn't it?

Q Yes.

[734] A. The same thickness as the crown?

Q. Yes.

A. That bolt there has been stripped.

Q. Which one is that?

A. The one with the figure six; but now whether it was stripped prior to the pull or after the pull I cannot say, but it looks to me like it had been stripped prior to the pull; yes, that is right. Now, when it was pulled, it was pulled with an opening of about—of a four-inch hole over the top of the pulling machine—the bolt had not been nicked under the head and it was pulled and it broke in the body before it did go; it drawed the sheet down approximately a half an inch, and left the head absolutely parallel to the body; in other words, it is straight and not like that (indicating).

Q. On that sheet, are there any indications of the heads having been forced into the plate? In other words, are there any indentations around the holes?

A. Yes; there are indentations there.

Q. Could those indentations have been made around all of those holes in the sheet where it had water on top of it?

A. They could have been marked there, but the indentations wouldn't have been as deep, if the bolts, for instance like this, there is an indentation there (indicating), and from the depth of the indentation it looks to me that it has been made by their forcing and forcing and forcing that bolt until they stripped the head, and the vibration of cutting of it would put it to that extent. If that

[735] bolt had been kept in to throw that indentation to that depth, the bolts in that sheet would have been no good.

Q. They could not have been used at all?

A. They would have been destroyed before the pressure would have been put on the boiler.

Q. You mean before the engine was put in srvice at all?

A. That is, if it had been subjected to the same conditions this bolt was (indicating).

Q. Now, Professor Randolph says that this bolt head (No. 10), a part of the screw being left on, shows that it came down from being ripped by the force of the explosion and not from being pulled when it was hot. What do you say as to that?

A. That part that is left on that bolt, that is, this threaded

part, I do not believe that the overheating of a part of the crown-sheet or anything else had to do with that. I believe, if there was anything at all that let that stay up there, it was probably in the manufacture of that bolt, a flash, and it pulled off here and left it there, the flash was put in here (indicating), it is called a flash, that is, when you make a weld or put two pieces together and make a weld, and you weld it up good, but sometimes a little end on each side will stick up, a good many call it an inferior weld, it is not simply that, but if that is opened sufficiently it wouldn't break that because this would give
[736] before it gave there (indicating); this was the stoutest and held it ,and this (indicating) was a little flash in there; in other words, the weld wasn't right up tight.

Q. Does that flash injure or strengthen the bolt?

A. No, sir; because the bolt held; if anything it strengthened it; it held where it failed on the opposite side. If that occurs on a cold pull like that (indicating), that probably would have broke there (indicating); but it left it out down in the drag-down in the fibers.

Q. Does the color of these bolt heads indicate that they were pulled when hot or cold?

A. Which bolts?

Q. These bolt heads that you handed to me, these here (indicating).

A. They failed and let go while they were hot.

CROSS-EXAMINATION.

By Mr. Hunt:

Q. Your idea is, Mr. Doarnberger, that bolts Nos. 1, 2, 3, 5, 6, 9, 10 and 11 let go while they were hot the first batch that you put out there?

A. Yes, sir.

Q. And as to the second batch, how hot were they?

A. Not quite as hot as the others.

Q. In all of these bolts here which you have picked out first, you did not see any difference then in the temperature at which any of those bolts were heated?

A. If anything, they are all about the same, and the con-
[737] vex in them is not right up to a hair, every one you know, but they are about all the same. There (indicating) is a bolt there that is like that; that bolt is more or less corrugated since the explosion, it has got what is called damp rust; they let that bolt

get damp, the same as this one, which you can tell by the fibers.

Q. Now, then, if I understand you, this first lot of bolts that you picked up, as I have numbered them to you in my last question, were bolts that you can see no difference in the heating in, and your idea is that they were all of the same temperature?

A. Approximately so.

Q. Now, Mr. Doarnberger, the heads of these bolts being nearest the fire, and if the sheet went down, as you think, from heat, would these bolts be just as hot as the sheet?

A. If they would be anything they would probably be a little bit hotter than the sheet.

Q. Because there is more exposure to the fire?

A. Yes, sir.

Q. Now, in this lot of bolts which you picked out, you happened to pick out the one with the figure nine on the bolt, which Mr. Slayton tells us was not in this wreck, and is a bolt which, he tells us, was never heated except to a dark red or a dull red, a bolt which Professor Randolph said wasn't as hot as these other bolts, in his opin-
[738] ion, and the bolt which Mr. Lewis tells us wasn't quite as hot as the others. If this bolt was only heated to a dull red, the balance of those bolt heads which got a little bit hotter than the sheet, were likewise heated to the same temperature in your judgment, and the sheet did not get beyond that temperature in your judgment. Is that true?

A. I didn't tell you how hot these heads were.

Q. I know you did not, but fortunately one of those bolt heads was heated under the observation of a man's eyes, and they brought it in here and told us about it. I asked you if that is not true, that, assuming No. 9 bolt head was never heated beyond a dark red or a dull red, then in your judgment the balance of these bolt heads and the sheet never went in excess of the heat of that bolt head, did it?

A. I say that all of these bolt heads were heated and heated to a point of failure. I don't care what No. 9 is or what the others are, they have been heated and they have been subject to the same drag-out, regardless of the heat; they have been heated to a point of failure and it was done without water on them, all of them.

Q. Subjected to the same drag-out as No. 9, and you don't care what the other people said about it?

A. No, sir; I am basing it on the drag-out.

Q. You say that No. 9 was in that wreck, whether other people say so or not, is that right?

A. Didn't you say so?

[739] Q. Didn't you say it was subjected to the same drag-out?

A. It was put through the same process principally.

Q. Now, then, assuming that if all of these bolt heads, including No. 9, as shown by their appearance, indicate to you that they received the same degree of temperature and that the crown-sheet likewise received that same degree of temperature, which they say in No. 9 was a dull red, I ask you what the tensile strength of that sheet and bolts per square inch is if heated to a dull red?

A. I don't know.

Q. You don't know?

A. No, sir; I don't know the tensile strength of those bolts or that sheet; I do in a way.

Q. How hot do you think that sheet was heated?

A. Probably to a light cherry red or to the point of failure; it was heated to the point of failure.

Q. Won't you indicate it in color to us?

A. It was heated to a cherry red and point of failure.

Q. The first day when you came up here, when Professor Randolph was on the witness stand, do you recall saying to Mr. Staples and me in this room here that that sheet never reached a cherry red at all?

A. No, sir; I never said that.

A. If I made a remark like that in there I do not remem-

[740] ber it at all.

Q. Do you remember saying it never got beyond a dull red?

By the Court:

Do you mean at the same place and time and to the same parties?

By Mr. Hunt:

Yes, sir.

A. No, sir.

Q. Do you recall that this further question was asked you, whether or not Mr. Walton, if he looked in his fire box and the sheet was a bright red, a cherry red, that he could not tell the difference in the glow, and didn't you reply, "Oh, but this sheet never got beyond a dull red."

A. Now I remember exactly what you are talking about. You asked me that question as I walked into the room and I came back and said as far as the light in the fire box and the crown-sheet becoming so hot as to make a ray sufficient, you could notice it in the fire box

never, and I told you that there was a brick arch between that ray if the crown-sheet had reached that heat that would dull it by the time it reached it.

Q. Do you deny that you told us that this sheet never got beyond a dull red?

A. If I told you anything I told you it got a bright
[741] cherry red, if I told you anything at all, but I remember the conversation about the other part all right.

Q. Now, Mr. Doarnberger, if this sheet was heated, the injury to the sheet was at the time of the heating, wasn't it?

A. Yes, sir.

Q. Could you examine this sheet on the 19th of November, 1912, and state whether that crown-sheet was heated on the 14th or on the 10th of that same month, or could any man tell when it was heated?

A. I won't go back beyond my examination of the 19th, at the time I entered the fire box and examined it and found conditions as I have written them in my letters and made my report; I don't care whether it was a month or a day before, I am only telling you what I saw on the 19th.

Q. I don't think you understand my question.

A. Yes, sir; I believe I do.

Q. If you do, I believe you will answer it a little differently. Let's see if you understand it. Could you or any other living man reach that boiler when it was cold after the point of failure, and say whether the burning of that crown-sheet was done on the 14th or on the 10th?

A. No, sir.

Q. That is what I thought. Then you did not understand me?

A. That is all right.

Q. If this crown-sheet was burned on the 10th to the extent of buckling or bagging between the bolts and on the 14th failed, the burning on the 10th would necessarily have weakened the
[742] holding power of the stay-bolts, wouldn't it?

A. Not without it got to a point of failure.

Q. Suppose just before the point of failure the burning was sufficient to buckle the sheet, wouldn't it necessarily have weakened the holding power of the sheet and the stay-bolts?

A. What evidence have you of prior to that?

Q. I am not pointing out the evidence in this case to you to permit you to argue the case; that is one of the duties that is assigned

to counsel; but I am asking you to assume that as a fact. What would your answer be?

A. I will answer your question in this way, that had that boiler at any time prior to this accident been let get low to a point of failure, then there would have been the same evidence either by the sheet buckling, and the buckling would bring on a leaking of the crown bolts, the crown bolts would have leaked, and that would have been noticed and there would have been an examination made. Now, if it wasn't noticed and no work done on it, then that boiler was subject to no failure or any weakness.

Q. You are assuming that the inspectors of that railroad did their duty, aren't you?

A. Of that part of it, is all I say.

Q. But does not your answer to my question assume that the inspectors of that road did their full duty?

A. I don't know what the inspectors done.

[743] Q. Doesn't your answer to my question assume that they did?

A. I don't know; I am telling you what ought to be and what should have been done.

Q. We all know what ought to be done, at least we think we do.

A. I don't know; I am telling you what taken place.

Q. What percentage of engines on the Norfolk & Western today under your supervision are in service showing a buckled condition of the crown-sheet?

A. I don't know; there is approximately over 1100 engines on that road.

Q. Give us some idea.

A. Probably, I would say, in the 1100, probably two or three per cent, probably 25 or maybe 30, or something like that; but slightly, just slightly now.

Q. Then you have on the Norfolk & Western today about thirty engines in service every day, the crown-sheets of which are bagged between the bolts?

A. Slightly, slightly; some of them bolts have been renewed and set back and the sag has stayed there, it wasn't sufficient to take it out.

Q. Isn't it true that the heat when applied in that fire box to a temperature of, I believe, 380, fire box heat, which is the steam heat, I believe?

A. 387 degrees, Fahrenheit.

[744] Q. All right, when that heat is applied—

A. (Interposing.) That does not mean water in the boiler.

Q. Yes; that is the fire box heat.

A. Now, go ahead.

Q. 387 is the fire box heat, isn't it?

A. That is the temperature of the water.

Q. There is heat there to produce that—your fire box heat is what?

A. I don't know just exactly what the temperature is.

Q. It is in excess of hot water, isn't it?

A. Yes; I guess it is.

Q. When you apply that heat under a crown-sheet that is buckled with a leaking tendency, isn't it true that the expansion of the iron has a tendency to check that leak?

A. No; the expansion of the iron has a tendency to open the leak.

Q. Has a tendency to open the leak?

A. Yes, sir; expansion has a tendency to open; contraction will close it, but expansion will open it.

Q. Haven't you got that exactly reversed, Mr. Doarnberger?

A. No, sir; I have it right.

Q. You say that the contraction of the iron will close the leak?

A. No; the contraction of the iron will open the leak.

[745] That is what I asked you; I asked you if the expansion of iron wouldn't close it, and you said no, the contraction would close it.

A. I said the expansion will open it and the contraction will close it.

Q. Now, isn't it true that when heat is applied to the crown-sheet and the bolts, which creates an expansion, that checks or has at least a decided tendency to check the leakage of the boiler?

A. No, sir.

Q. Why not?

A. Because expansion opens the leak and contraction closes it.

Q. Now you have gotten back to the other point, which does close it, the contraction or expansion?

A. The contraction closes it.

Q. Now, you are sure of that, are you, that contraction of iron closes a leak? Aren't you mistaken about that?

A. Contraction closes it.

Q. Closes the leak, you say there is no doubt about that?

A. I have answered you three times that contraction closes it, and I ain't going to answer it any more.

Q. You say it closes the leak. Mr. Doarnberger, I am not trying to catch you at all, I think you have just gotten it mixed, that is all, and I want to give you a full and fair chance to see if you are not in error. I want to be perfectly fair with you. Contrac-
[746] tion is when the iron gets smaller, isn't it?

A. Have I got to answer that again, Judge?

By the Court:

Yes; he has a right to ask you that.

A. Yes, sir; contraction takes up.

Q. Is that when the iron itself gets smaller?

A. Yes, sir.

Q. And expansion is when the iron itself gets larger?

A. Yes, sir.

Q. Then isn't it the expansion of the iron that closes the leak and not the contraction?

A. No; it is the contraction that closes the leak and expansion opens it.

Q. I think the difference between us is that you are talking about the contraction of the hole and I am talking about the expansion of the iron.

A. Yes; and I will tell you right now, when expansion comes on iron expands and the whole thing bends with it; contraction comes on, the iron closes up and the hole closes with it. I know what you are trying to do; they all move together, uniformly.

Q. Take this sheet with a bolt in it, in a leaky condition, we will heat that to a point where the iron expands?

A. Yes, sir.

Q. Doesn't the expansion of that iron in the first place
[747] made this bolt bigger?

A. Yes, sir; if the bolt is heated with that.

Q. Yes; both being heated, it makes that bolt swell up?

A. Yes, sir.

Q. It causes this iron here likewise to swell out and expand?

A. Yes, sir.

Q. It causes this iron to expand?

A. Yes, sir.

Q. If this iron is expanding, going up to meet the bolt—

A. (Interposing.) What do you mean, expand or contract?

You jump to contract now. You make yourself very plain, I am going to listen to you now.

Q. I think you have got it twisted.

A. No; I have got it right but you are trying to twist me up.

Q. Indeed I am not. If the bolt and plate both being heated to the same temperature, it certainly is true that the bolt swells with it?

A. Yes, sir.

Q. That isn't contraction, is it, that is expansion, isn't it?

A. No, sir; that is contraction.

[748] Q. Taking this same plate and getting off our heat proposition, and going to something else we won't have no disagreement on. Now, the force which was applied to this, you say, was through a four-inch opening?

A. Approximately; I did not say what it was; I said about four inches approximately, and it was much hotter than up close to the bolt.

Q. They told us it was three inches.

A. I say approximately four inches.

Q. If it had been a four-inch opening instead of three inches, you would have found a greater sagging of the plate, wouldn't you?

A. The larger the opening the greater the sag.

Q. The opening on the crown-sheet is a four-inch opening, as compared with this, isn't it; because the radial stays are four inches apart?

A. Yes, sir.

Q. If this is tested on a three-inch opening, it is not the same as it would be if it was a four-inch opening, or if a four-inch opening is applied, would it?

A. No.

Q. Isn't the force applied to this plate exactly the reverse of the force applied to the crown-sheet in a boiler?

A. No, sir; if he had a four-inch opening or assuming it is, pulled on that bolt at all four points, he would have the same condition if you pulled that cold, as this would pull (indicating).

[749] Q. I will ask you, please, to take this sheet and the other one which they say was pulled cold, and tell the jury if the threads in each instance are not torn out. In other words, you see the other threads in it when you hold it this side, do you, and turn it this side and you cannot see the thread, isn't that true?

A. Wait a minute, I will talk to you a little.

Q. All right.

A. When that comes down there, the pull, as that iron pulls down, assuming he had that in a four-inch opening, came down and got to going down, I believe when it got to that part (indicating) it stopped this way, it took a permanent set, and this became the weakest point and failed (indicating). As that went down, going through the neutral axis of this metal, that is closed because this (indicating) opens, and that is why you find the opening in the bottom.

Q. Don't you find the reverse conditions of that on that crown-sheet?

A. No, no.

Q. Isn't it true that you can stand on either side of that crown-sheet and see the threads in it?

A. No; the largest opening of them holes in that whole thing, you will find it—

Q. (Interposing.) Tell me about that.

A. All right, I am going to tell you, the largest holes you will find on that plate, you will find on the fire side, the largest, now, that is, if we can detect it.

[750] Q. I think we can; I want to test the accuracy of it to see if you haven't got it reversed again. The largest side of the opening now, you say, where the threads are most visible, is next to the fire, that is what you told us, isn't it?

A. Yes, sir.

Q. Now, think once again and see if the largest opening on that plate isn't next to the water?

A. The largest hole is on the fire side of that sheet, and the smallest on this side, the water side.

Q. The bolt in this instance was on this side, wasn't it?

A. The head of the bolt was on this side.

Q. Now, do you find the largest thread where the bolt was or where the head of the bolt was?

A. We find the small thread is where the bolt head was, and the largest at the reverse side of the head.

Q. That is exactly what I thought

A. That is right; you are right there.

Q. You done got wrong on that sheet, though.

A. No, I haven't.

Q. Do you say that the largest opening in that hole where the threads are most visible is next to the bolt head or next to the bolt?

A. The largest opening of them holes is next to the bolt head.

Q. And not the bolt?

A. Yes, sir.

Q Was the largest opening in this (indicating) next to
[751] the bolt or the bolt head?

A. The largest of that was opened on the opposite side to the head.

Q. Next to the bolt and not the head?

A. Yes, sir.

Q. Why should the crown-sheet be next to the bolt head, the largest opening of the crown-sheet be next to the bolt head if the largest opening in this is next to the bolt?

A. I am talking about bending the sheet; I am telling you this was closed and this opened (indicating), and that was bent otherwise.

Q. Now, let's come back.

A. I am going to answer it that way every time you ask me.

Q. I ask you again, is the largest opening of that hole in the crown-sheet next to the bolt head or following the length of the bolt?

A. The largest opening in that hole is on the fire side next to the bolt.

Q. To the bolt or bolt head?

A. The bolt head.

Q. Why isn't it so in this case?

A. Simply from the fact this bolt (indicating) went down like that (indicating), you have the idea that because the bolt pulled the iron plate—it is the curvature of the iron that opens it there
[752] and closes it here (indicating).

Q. I asked you if exactly the same pressure wasn't put on this that was put on the crown-sheet?

A. The sheet bent different.

Q. That is exactly what I asked you, and if it was not exactly the reverse pressure.

A. That sheet was pulled this way, you see, and that one this way, and here is the head (indicating).

Q. That is exactly what I am trying to get at. Then the thread in this case is torn exactly opposite to your thread in the sheet?

A. That is bending all of that plate, and when that went down over there, it tore these heads off and bent the plate that way (indicating).

Q. All right.

A. When this went down it broke the body and pulled it the other way. The iron gathered here (indicating), stretched here and gave you that taper in that hole, the same as over there.

Q. I don't credit you with any desire on earth to get it twisted,

if you could. Isn't it true that the force, according to your contention, on that sheet was applied from the bolt down on the sheet, the pressure?

A. Just as you are holding your hand now?

Q. Yes, sir.

A. Yes, sir.

Q. Isn't it true that the force in this engine was applied
[753] exactly opposite, isn't it so?

A. No, sir; it is the same principle.

Q. I am not talking about the principle, I am talking about the force.

A. Force, it is the same thing.

Q. Isn't the force applied in this case below the sheet and in that case above the sheet?

A. You could have burned that up and had the same thing again.

Q. Could heat have been there when that was burned up?

A. It was equally distributed whether you burned that sheet that way, or whether you burned it this way (indicating).

Q. I will ask you this, in the test which has been made here by Mr. Slayton and Mr. Sample, wherein the bolt heads have pulled off, after the bolt head and bolt was screwed very tightly into the iron and heated, they tell us that in both of these instances the head pulled off below the plate. Did you hear that?

A. No, sir.

Q. This is the plate (No. 7) they told us was tested hot, and when the bolt head and part of the bolt was heated that the plate was put in a test machine and in this instance the bolt head pulled off and knocked the bolt broke. Was that due to the tight screwing in of the bolt or what was it due to?

A. Where is the heads of these bolts? I want to see them.

[754] Q. Here they are handing same to witness).

A. Have you got the body of this bolt?

Q. Yes, sir; here it is (handing same to witness).

A. Now, what is your question?

Q. Please read the question to him, or I will put my question again. My question is, the threads of that bolt, so far as I can determine, does not show any injury by tight screwing in of the bolt, does it?

A. No; that bolt was applied all right.

Q. Now, they tell us that when they put that bolt in they use a three-foot wrench?

Q. Then I will put the question this way. These bolts are nicked for the purpose of permitting them to break off as you twist them in the boiler, aren't they?

A. If you get them down below this section here (indicating) or much lower here than there (indicating), sufficiently to tighten them up good, they generally break off. In some places they won't allow that, but there is no objection to it; some put it up tight enough, and when it sets itself it ought to wrench off.

Q. This is put there for the purpose of screwing that bolt [755] in, isn't it?

A. Yes, sir.

Q. And in this particular instance, any way, these bolts were screwed in the crown-sheet until they were wrenched off?

By Mr. Hall:

No, sir; that is not so; they were screwed in and nicked, and knocked off.

By Mr. Hunt:

The boilermaker from Princeton says that is what they did.

Q. Now, Mr. Doarnberger, that is a common practice, you say, to screw this in until this does wrench off?

A. If they get them down far enough to pull the section here (indicating).

Q. It takes a right good wrench for that purpose?

A. No, sir; not so much.

Q. What sized wrench?

A. You can take a 24 or 26 or 28-inch wrench and do that, if they nicked it about three-fourths or five-eighths of an inch through the section.

Q. Nicked as that is?

A. That bolt won't wrench off, that bolt is not nicked, that will strip, the same as that was stripped (indicating); that will strip that thread before this will wrench off.

By Mr. Hall:

They were made large and made that way for the purpose of testing whether you could screw them in tight enough to injure the bolt in the head.

Witness:

Here is about a standard head.

[756] Q. Well, let us lay this aside and take up one that there is no question about. This is supposed to furnish you a hold for your wrench to screw this bolt in until, when being nicked, it screws off?

A. Yes, sir; that is about a standard. Now, then, they will take and nick that right in there (indicating), and that will wrench off by the time this sets, without destroying that thread.

Q. They told us that after they screwed this (indicating) in that plate and gave it a test under heat, the test which they brought into court, pulled off under the head and that they did not nick them and screw them in that way, but tested them cold when they broke in the body. That being true, what would it indicate, that the tight screwing of the bolt in the plate had injured the tensile strength of the bolt head?

A. Mr. Hunt, you have asked me so much there, I really don't remember one-third of it.

Q. Read the question to the witness.

(Question is here read to the witness.)

A. Screw which in that plate?

Q. The bolt; it is immaterial which one.

A. I want you to tell me which bolt you are talking about now; I want to play fair. Tell me what bolts you are talking about.

[757] Q. It is immaterial which bolt; it is the principle involved that I am trying to get at, irrespective of any bolts.

Q. Pick up the bolt you are talking about.

Q. We will leave all the bolts out, and I will ask you if it is true that a bolt screwed into a plate until the head wrenches off and put under a tensile strength test, under heat, and the bolt head pulls off, while a different test made cold, the bolt part in the center of the bolt, would that indicate that the tight screwing in of the bolt head had weakened the tensile strength thereby?

A. No, sir. Now, I will ask you a question.

Q. No, don't do that.

A. I have a right to answer the question.

Q. You said you were going to ask me a question.

A. When they took that bolt and nicked that head and screwed it up there, sufficiently to wrench the square off, and heated it, that is, the plate and bolt, and put it in the machine and pulled it, certainly it would break off under the head.

Q. That is what I have been trying to get at, Mr. Doarnberger.

A. I am not through. Then they take another bolt and that was put in cold, and they turned that down and they wrenched until they wrenched the thread off. Yes, it would break in the body.

Q. That is perfectly clear, under those conditions, you would expect it to break at those two points.

A. Yes, sir; I am talking of hot and cold bolts.

[758] Q. Hot or cold, you would expect these identical results?

A. I am talking how a hot one would break and how a cold one would break, applied under same conditions by wrenching the head off, at one heat it will break under the head, and take another one or a cold one and turn it until you wrench the head off or pull it off, and it don't break in the body it is a bad weld.

Q. Isn't that upon the theory that, having applied your bolt so tightly to the sheet that when you then put it in the fire, under your theory, the expansion, and I submit it is expansion and not contraction—under the theory of expansion it is that iron expanding and coming up against the head and the bolt head expanding and going down against the iron, that causes that weakness. That is true, isn't it?

A. No; the movement of the load on that part (indicating) is taken from the body; the bolt had fibers, you know. A bolt will stretch and whatever load will come on it, it is figured out, a four-inch body and a four-inch bolt, that will withstand the heat is away beyond the elastic limit of the body of the bolt, and you have not only got the head to protect it, but it has got the thread for holding power.

Q. If that bolt was heated at the head and heated up to a point one and a half inches above the head?

A. You mean below the head?

Q. Yes, sir. Where do you expect it to part?

[759] A. Right there (indicating).

Q. Isn't it true that in every bolt that you saw in the old boiler was heated for as much as an inch and a half above the head?

A. No, sir; it was just on the point of each bolt, probably from three-eighths to half an inch on the end of each bolt, about the thickness of the sheet or maybe a little more. You take that bolt there (indicating) and it is broke off first on the fire side of the sheet, and it went through a plate three-eighths of an inch thick, and the end of that bolt was discolored three-eighths to half an inch.

Q. They told us an inch and a half?

A. Probably some heads would generate that far; I couldn't s

COPY BOUND CLOSE

it; they have got better eyes than I have, probably.

Q. If it was heated up for an inch and a half above it, you would expect it to part above the sheet?

A. No, sir; the hottest part was right there, up in there (indicating). It would have the protection of the steam, moisture would help that; but right there under the head is where it gave way.

Q. Can you or any living man look at that sheet and tell to what extent the corrugation or bagging or sagging was prior to this failure?

A. No; you could only probably judge that by if they would know where these heads came through the overheated area, just exactly, and these came out. I will venture to say—

[760] Q. (Interposing.) Don't venture.

A. I will say they came out of the hottest part, then these bolts that I picked out first, if they could put that through there and then get a section that bent, going down this way and then up (indicating), then you could get it. I don't know, but I believe that Mr. Slayton illustrated that pretty nicely, but I wouldn't say that is just right, however; this drop is here (indicating), and this drop is here (indicatin), going through; that is really the buckling between the bolt this way longitudinal through the plate.

Q. These you think were in the hottest part?

A. The ones I picked out first.

Q. These two you hold in your hand you think were?

A. I don't know.

Q. Look at them and see.

A. Give them all to me.

Q. You happened to pick up No. 9 again, that they say wasn't in it?

A. I don't know, you might switch some of the bolts on me.

Q. As a matter of fact, do you know whether any bolt in that lot ever came out of that boiler?

A. When I was there and made my inspection, Mr. Bowden wasn't there, and I went to Mr. Slayton's office and he took me. I think his office was over the depot, and he took me on up to where the sheet was, and he told me when I got through that he wanted

[761] me to come back and have dinner with him, and he asked me whether I needed any assistance, and I told him no, that I would rather be left alone and have nobody about, and when I came out I asked for the bolts, I couldn't find none.

Q. There was none about the boiler?

A. No, sir; none at all; that is, heads now; and I went and in-

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quired about them and they said Mr. Miller was the man, and I asked him and he had them there packed up in a little box.

Q. Mr. Miller?

A. I think that was his name, but I am not sure; the assistant foreman, anyhow, of the shop. Then I examined those bolts carefully, all they had, and it looked to me that they had more than that, there was a box that wide and that long (indicating), and I looked over them. The only thing I can say, is that I saw them there and I will have to rely on the honesty of the management of the Virginian Railway to have them here; if they are so dishonest to bring something else here, that is different. But there is one thing I will say, that without they had the same condition of the 469, they could not have manufactured those bolts.

Q. They could have picked them from any other crown-sheet that went down?

A. If they wanted to be dishonest they could.

[672] Q. As a matter of fact, do you know whether any one of those bolts were ever in that boiler?

A. Only by the honesty of the Virginian Railway management sending them here.

Q. Mr. Miller was the man who had them in charge at that time, you say?

A. He had them there and when I asked him if he had all of the heads saved from this boiler, he said yes, and I laid them out and looked over them.

Q. There were a great many more than these?

A. Yes, sir; if my memory serves me rightly, there were.

Q. When an inspector goes to make an inspection of that kind the bolt head is one of the principal things he relies on, isn't it?

A. No, not necessarily so.

Q. Could you do it without the bolt heads?

A. I could tell the condition of the sheet without that; I like to see them, it helps you; but so far as the bolt heads, we had several of them, and we never found the bolt heads—

Q. (Interposing.) I am not talking about that. I asked you this question, if you or any living man can tell how far that was bagged down before the failure of the crown-sheet, and you answered me that you would base your calculations on these bolt heads, didn't you?

A. I don't remember that.

Q. Well, do you—what do you say about it now?

[763] A. Read that again.

Q. I asked you if you or any living man could tell the extent that that crown-sheet was buckled down before the explosion, and you said that you would base your calculation of that upon the appearance of these bolt heads, didn't you?

A. Yes, sir.

Q. Can you base it on anything else?

A. Yes, sir; I can base it on the discoloring, the demarcation on the sheet under the bolts and there is a lot of evidence besides this. You asked me about corrugation, and I said corrugation, that it could be based on that.

Q. Give me those things again, discoloration?

A. Yes, sir.

Q. What else?

A. And the color under the bolts.

Q. What else?

A. And the drop of the crown.

Q. Is that all?

A. If there is any more of them as we go along, I might think of it.

Q. Will the discoloration indicate to you or aid you in any way in determining how deep the bagging between the bolts was before the failure?

A. No, sir.

Q. Then we can cut that out.

A. No, sir; I am going to take the sheet as it is now; [764] don't cut that out; no.

Q. If that discoloration of the sheet will enable you to figure the depth of the sagging in that sheet between the bolt heads, please explain to the jury how it is possible you can do it?

A. You mean the sagging prior to this here?

Q. Yes, sir.

A. No, sir.

Q. That wouldn't help you on that?

A. No, sir; I am talking about the sheet as it is, the way I find it.

Q. The discoloration wouldn't help you to determine the depth of the bagging between the bolts prior to the giving way?

A. No, sir.

Q. Would the color under the bolts aid you in that in any way?

A. Yes, sir; the bolt that remained in the roof of the sheet, the discoloring of the end of the bolt that was screwed into that sheet; yes, sir, that will.

Q. How?

A. It will be a very blue oxide, the color of that sheet, and probably it shows more plainly really than the sheet does, the ends of the bolts.

Q. If the color of the bolts left in the engine is a blue oxide, how deep does that indicate the bagging was between the bolts before the accident?

A. I cannot tell you that.

[765] Q. I thought you said you could?

A. No; I did not.

Q. Then do you say that the color of the bolt ends will not aid you in determining the extent of the sagging between the bolts prior to the accident?

A. No, sir; it will, I will say that again; no, sir; it won't do it.

Q. Now, will the drop of the crown enable you to tell the extent of the bagging between the bolts prior to the accident?

A. No, sir.

Q. Then have you got anything on earth to determine that except these bolts?

A. Yes, sir; I have.

Q. What?

A. The discoloring of the sheet between the blue oxide and the ordinary surface rust. I am talking about the crowned end of the button head bolt and the dropping of the sheet.

Q. I do not think you understand my question.

A. Yes, sir; I do.

Q. Tell me again, then, if the discoloration in the sheet—

A. (Interposing.) Of the uncovered area, the overheated area.

Q. That the discoloration, or the color at the end of the bolt, with the drop of the crown will enable you to figure out how deep or to what extent the bagging between the bolts was prior to the

[766] giving away?

A. No, sir; that won't do it; I told you that three times. Them conditions won't enable me to give you the buckling prior to the failure.

Q. I know that is bound to be true; but you have said, as I understood you, at least, that that would do it?

A. I didn't no such thing.

Q. Then I will ask you if there is anything on God's earth that will enable you to tell the extent of the bagging between the bolts prior to the giving way except these bolt heads here before you?

A. I wouldn't need them, and I can tell. I don't need those;

I can tell by the discoloring of that sheet, by the ends of those bolts and the drop of that.

Q. I think you misunderstand me again.

A. Not on your life; I understand you very well. I tell you what you want me to do; I cannot do it; I cannot tell what that buckling was prior to that failure when it let go and went down.

Q. That is what I want to know.

A. I told you I could tell afterwards.

Q. How much it is buckled down now?

A. I can tell by the failure of the sheet.

Q. You can tell now it is buckled down, can't you?

A. Yes, sir; it has gone way down ten and three-quarter inches.

Q. But you do tell me that prior to the giving way you don't know the extent of corrugation between the bolts?

A. No, sir.

[767] Q. If you don't know the extent of corrugation between the bolts prior to the giving down, how can you tell Mr. Hall that it would leak?

A. There is corrugation there, and if that were cut out prior to the explosion they would have found corrugation there sufficient to make it leak.

Q. How do you know unless you know the extent of the corrugation?

A. Corrugation is bound to take place before the drop.

Q. I asked you if the corrugation is there prior to the accident, as you tell us, about thirty of your engines are in service with corrugations, and you told Mr. Hall that if the amount of corrugation as indicated by this sheet, the corrugation and not the drop, was on that sheet prior to the giving way of it, it would have leaked, didn't you?

A. Yes, sir.

Q. Now, then, how much corrugation was there prior to the giving way?

A. I couldn't tell you to the extent of the depth of it, but there was enough to keep on coming and coming to the point of failure.

Q. We are assuming that the corrugation was there prior to the point of failure and prior to the failure.

[768] A. What do you mean?

Q. Before that morning or before that night.

A. There would have been evidence there if there had been.

Q. What evidence would there have been?

A. I will have to answer the question the same way.

Q. All right.

A. Had that boiler sometime prior to this accident been let get low enough in water to cause corrugation, which would have followed leakage, then that boiler would have leaked; it would have been noticed and it would have been worked on. Now, if that boiler had not been gotten low to the point of danger and there was no evidence of that, then the boiler was never in any way injured.

Q. The point I am trying to get at is, can you tell the jury, assuming that the corrugation was there prior to the accident, at some other time, can you tell the jury the extent of that corrugation?

A. If there had been corrugation there prior to the accident, I don't know whether there was or not; I don't know.

Q. You cannot tell there was?

A. Prior to the accident, no, sir.

Q. Then, of course, you cannot tell the extent of it?

A. Prior to the accident, no.

Q. Then, not knowing the extent, you couldn't tell whether it would cause a leak, could you?

A. Prior to the accident, no, sir.

[769] Q. The lines of demarcation on a sheet are the same, or about the same, under the bottom side as it is on the top side?

A. You mean in coloring?

Q. Yes, sir.

A. No, no; there is absolutely a difference between the two.

Q. A difference between the color?

A. Yes, sir.

Q. But the point of low water would show underneath just the same as it would show on top?

A. About, yes; you could trace it, but not like you could draw a line straight on a paper.

Q. But wherever you could trace it, it would be at a corresponding point on the sheet?

A. Nearly.

Q. Now, I want to see if you have not missed it about an inch and a half.

A. Probably I have missed it three inches.

Q. Your line here, where I hold that pencil, is that your line?

A. I made it a little heavy over there.

Q. When you get on that side it is a little over here (indicating).

A. Yes, sir.

Q. Now, do I hold the pencil right there?

A. Yes, sir.

Q. Is that right?

[770] A. No; that is a little low there; I was a little nervous there.

Q. What I want to ask you is, if the line of stretching, where the stretching begins, the line which you have followed on both sides of that sheet?

A. No; the stretching may have moved something on the water side slightly, but not on the fire side.

Q. I thought you told us that the stretching on the fire side eliminated the soot, which was one of the means of determining that?

A. No, sir; I did not.

Q. Is that true or not?

A. No, sir; I didn't say that.

Q. The man that said that did not know what he was talking about then?

A. I don't know whether he did or not; I am talking about myself, I don't care what anybody else said.

Q. You do not believe that is true?

A. What?

Q. On the bottom side where the soot gives way.

A. The soot?

Q. Yes; the soot or whatever it is that clings to the sheet in the firing?

A. I call it ordinary surface rust.

Q. Now, where the surface rust gives way on the fire side, you do not think that is in a line, do you?

A. No; wherever you can see ordinary surface rust, there has been water there; where you see the blue oxide or demarcation between the two, is the only means we have for tracing the water

[771] line, as I have done in this case.

Q. If there was a mud deposit on that sheet, the crown-sheet could burn with water over it, couldn't it?

A. If it would have a sufficient deposit, it wouldn't burn; that is, it wouldn't drop the crown-sheet; but it would cause a corrugation and cause the bolts to get loose and leak. Do you mean if there would be a heavy deposit, incrustants that would keep coating and coating?

Q. Yes, sir.

A. Yes, sir; it will make an improper circulation.

Q. And your sheet will go down from it, if I understand you?

A. Yes, sir.

Q. If at this end where you said it was not the hottest, as you drew your diagram there, didn't you find evidence of a mud rust there now?

A. A very light scale, just a coating.

Q. Doesn't the stretching of the sheet take away from it all question of rust as you have described, and mud deposit, and everything of that kind?

A. No.

Q. It relieves an evidence of it, doesn't it?

A. It won't be as clean as that (indicating); that has been burned off and burned off by excessive heat.

Q. Now, then, if that crown-sheet had been heated to a point of weakening the crown-sheet six or eight hours prior to this accident, you would see the same mark that you see now, wouldn't you,

[772] or some evidence of burning?

A. No, sir.

Q. Why not?

A. If it would have been heated six or eight hours prior to this failure, six or eight hours would have been in that condition, I mean down where it is at, the damage would have been done, if it had been under the same conditions six or eight hours prior to this the same thing would have happened six or eight hours and it would have met the same condition.

Q. You do not understand it?

A. Yes, sir; I do.

Q. Isn't it true that you can burn a sheet without its going down, so that you can see some marks of burning on it?

A. With water on it?

Q. I did not say anything about with or without water.

A. I do not know what you mean.

Q. Let us take the water off for the present; take the water off the crown-sheet and burn it, and it does not go down, can not you go there and see some marks of burning, the same as you could if it did go down?

A. You mean, if I put a piece of iron in the fire and burn it and burn it and make it hot and throw it aside, certainly you can.

Q. You can do it and the same evidence of burning is

[773] there, whether it was made yesterday, today, last week or last ten months?

A. On the contrary, I can take that and put water on it and you cannot tell; I can by the sediment that is coated over it, the same as this.

Q. But if it is cooled before the water is put on it, the mark is still there, isn't it?

A. The one mark is there, the fire mark.

Q. That is what I mean.

A. Yes, sir; you can tell the outside of that fire mark, as I have done here; I can tell the difference between the heated area and the unheated area, when I get to it.

Q. You cannot tell the difference between the heated area, assuming that heated area had been made six hours before, you couldn't tell whether it was six hours younger or six hours older, could you?

A. I do not catch you. What is that question?

(Question is here read to the witness.)

A. No, sir.

Q. Did you ever run an engine?

A. No, sir.

Q. You don't know anything about the length of time that it would take an engine to consume water, do you?

A. No, sir.

Q. You have no knowledge on that subject?

A. No, sir.

Q. Do you know anything about injectors?

[774] A. The only thing I know about injectors. I know how they are operated, I know how to put the water on, whether it would be a Seller or whether it would be a Monitor; but outside of the lifting of water and the amount that it would deposit and all like that, per minute and hour, no, sir; I know how they are applied and know when they work.

Q. Do you happen to know whether one injector is enough to run an engine of this type?

A. No, sir; no more than in riding along; I ride on the engine and see the engineer use his own injector and then sometimes they will holler over there, and they tell me they throw about six or seven hundred gallons an hour, but that is what I get from the boys at Blacksburg, and it will be 4500 gallons in it, and the heat of the boiler 378 degrees, pressure 212; I get that from Professor Randolph's little fellows; I help them along and try to give them a little practical experience with their paper work.

Q. Is is or not true that it is your custom and the custom of the road that you work for to refuse to give information, technical information, if they know that information will help the plaintiff in a suit against another railroad?

[775] Defendant objected. Objection sustained.

By Mr. Hall:

I have no objection to his asking the question if he applies to the witness for information in regard to this explosion and whether he was furnished that information or not.

Q. I will ask you if you had known information that would help me in developing a case of the plaintiff against this railroad, would you have given it to me?

A. Yes, sir; I have given it to you in my office, and you thank me for it; you spent the whole afternoon, you and Mr. Staples, and I showed you all my drawings, and everything before I came up here. I took my stuff out and you stayed all the afternoon with me. I told you the conditions of everything, and what I done, and you thank me for it. Mr. Lewis gave you permission to come to me and let me give you all the information I could.

Q. Didn't you limit us to theblue print, this thing right here, and didn't you decline to give us your written report?

A. If I am not mistaken, and I think my memory serves me rightly, this is what I showed you, and you asked me for a copy of that, and I told you I couldn't give you that; I told you the company would not allow me to give you that, but I would give you the benefit of it in my office, and I took you and showed you everything, and you told me there that you were sorry I wasn't with you.

[776] Q. Didn't you tell me that that report was private property of the road you had made it for and you couldn't show me your conclusions in writing, but I could see the sheet?

A. If I showed it to you I showed you the whole business, and I believe I read you that part of it, and you asked me if I couldn't give you a copy of that and I told you no, I wouldn't do it without either Mr. Lewis' or Mr. Kearney's consent, that if you went up and got Mr. Lewis or Mr. Kearney and let them say that I could give you this I would do it. The same way with the Federal inspectors, I say if you will go up and ask Mr. Lewis or Mr. Kearney I will be glad to give you any information, it is nothing to me.

Q. Did you ever testify for the plaintiff during your thirty-one years of experience, in any damage suit against any railroad on a similar question as this?

A. I never have, due to the fact that I never have been asked to. I have been asked by the Virginian and by the C. & O. and by Professor Goff of the Illinois University, in May, 1912, but I have never been asked, or I would go for the plaintiff if the plaintiff would

ask me.

Q. Is it a common occurrence that the water glass in an engine becomes clogged up with scale or a substance so that it does not show the correct level of the water in the boiler?

A. Yes, sir; it can become clogged.

Q. If the water glass shows a varying level in that boiler,
[777] it would indicate a rise of the level of the water in that boiler and it would indicate that the injector was putting it in there, wouldn't it?

A. I cannot answer you on the appliance and mountings of an engine; I did not examine the mountings.

Q. If the glass is stopped up at the top with a lime deposit or other deposit, would it correctly register the amount of water in the boiler?

A. No, sir.

Q. Suppose it is stopped up at the bottom, what then?

A. The same thing would happen, but I cannot answer you on the mountings. I did not examine any of them; that is out of my line.

RE-EXAMINATION.

By Mr. Hall:

Q. Did I understand you to say that you spent the whole afternoon explaining this boiler failure to the gentlemen representing the plaintiff?

A. They weren't down the whole afternoon, but they were there probably two and a half or three hours, or two hours, maybe not quite that long; but the better part of the afternoon.

Q. You say your recollection is that you showed them your report or read it to them?

A. Yes, sir.

Q. And they thanked you for the information you gave them?

A. Yes, sir.

Q. Why did they thank you and what did they say?

[778] A. After I got through, I told them there was no secret about it, and I went up to my files and showed them where I kept it and I got it down and I read my report, and attached to it was my diagram, and I explained it to them. They asked me a lot more questions and I kept answering them, and I said something to them and they said, "I am sorry you ain't with us, John," and I said, "I am sorry myself," but I do not like to say now what my reply was to them.

By Mr. Hunt:

Go ahead and say anything you told us.

A. I told them that they had hopeless case from a low water standpoint.

Q. What did they say?

A. They said they were very sorry I wasn't with them.

Q. You are on very friendly terms with both of these gentlemen, arent' you?

A. Bruce and I are old partners.

Q. And that is what you told him confidentially when he came to you and asked you about this case?

A. Yes, sir.

Q. You were asked some questions about being able to tell the extent of the corrugation on this sheet before it failed?

A. Yes, sir.

Q. Are there any corrugations on the sheet now, between the stay-bolt holes?

A. Yes, sir.

Q. You say that the corrugations before the failure must [779] have been greater than it is now?

A. Yes, sir; because the indications at the front end of the sheet there on either corner show pretty heavy now, yet where the stretch had not been across it, it is still remaining in there, the stretch did not take it out, it did not go down as far.

Q. If it was corrugated as much before the failure, as those corrugations in the corner show, why didn't the stretch take them out?

A. It was much greater up where it was hottest than down there; that would be evident right there; that corrugation down at the low point where it had not been so severely hot as where it had been severely hot.

Q. Suppose it was corrugated all over as much as it is in the corner prior to the time of the failure, would it have leaked?

A. Yes, sir.

RE-CROSS-EXAMINATION.

By Mr. Hunt:

Q. In that same conversation, didn't you also tell me that your road might get in trouble if you did anything against another road, and that you could not call on those people to help you when your road was in trouble?

A. No, sir.

[780] Q. How was it? Tell the jury how you said that?

A. I never said that; no, no.

Q. Tell us exactly what you said about that?

A. I never made a remark like that; I most emphatically deny that. I will tell you as far as other roads. If we would call on other roads to help us out, it ain't that we would probably have to call, we are not better than any other railroad, but I cannot recall in my thirty-one years, with the exception of a few years that I was with the American Locomotive Company and the Lake Shore in Cleveland, that we have asked a company to come over and assist us in anything of this kind, with the exception of the Federal boiler inspectors, and my report of eighteen boilers, nine of them turned in, I was sustained by the Federal government in Washington.

Q. By whom were you sent to Princeton to make this examination?

A. By Mr. W. H. Lewis, on account of Mr. Kearney being away; he telegraphed me to go.

Q. Mr. Lewis is the superintendent of motive power for the Norfolk & Western Railway Company, isn't he?

A. Yes, sir.

Q. And your salary is being paid now by the Norfolk & Western Railway Company, while you are here in this case, isn't it?

A. I havent asked about that question. If they do not

[781] pay it I am certainly going to ask the Virginian to pay it.

Q. Your salary while you were making this inspection in Princeton was paid by the Norfolk & Western Railroad that you worked for, wasnt it?

A. After I made my inspection and sent my report to Mr. Lewis, and he sent it on to Mr. Slayton, Mr. Slayton wrote back, thanking Mr. Lewis and paid me a compliment.

Q. I didnt' ask you about the compliment.

A. And he turned the letter over to Professor Leary, and he asked me to come up there, and he showed me the letter and he said he wanted me to see the letter, and Mr. Slayton in that letter asked what my expense would be, and I told Mr. Leary to tell Mr. Slayton that the expense would be nothing. That is what I told him, that I did not fell like charging two dollars going over and back, and I had lunch with Mr. Slayton and I did not like to send a bill like that in.

(Witness stands aside.)

[782] F. T. SLAYTON, RECALLED.

F. T. Slayton, recalled for Defendant:

Further examination by Mr. Hall:

Q. Some confusion seems to have arisen as to how those two cold tests were made. I wish you would tell, just identifying them by the number, how each one was made with reference to screwing the bolt into the plate?

A. The cold test, you mean?

Q. Yes; the two cold tests.

A. No. 5 was screwed into a three-eighths of an inch sheet.

Q. Nos. 6 and 8 were the two that were pulled? Take 6 and 8.

A. No. 6 was screwed into a plate three-eighths of an inch thick, with a three-foot wrench, until the threads in the sheet or bolt, I couldn't tell which, was stripped so that they would both turn around, pulled cold.

Q. That was No. 6?

A. Yes, sir.

Q. Now, take No. 8; how was that screwed in?

Plaintiff objected. Objection overruled.

A. No. 8 was screwed into a three-eighths of an inch plate tight and pulled cold until the bolt broke in the body.

Q. Was it screwed in tight enough to break off the head [783] of the bolt?

A. No; No. 8 wasn't. No. 8 was screwed into a three-eighths of an inch plate, tight, and pulled cold, until it broke in the body at 41,500 pounds. There was one screwed in until we twisted the head off.

Q. Which one was that?

A. No. 5.

Q. Was that pulled cold?

A. Yes, sir.

Q. And where did it break then?

A. It broke in the body.

Q. Now, Mr. Slayton, in connection with the inspection of this engine, I wish you would please state to the jury whether or not between the time the monthly inspection was made on November the 11th, 1912, and the time this failure occurred, it was the duty of anybody else to inspect this engine but Engineer Andrews?

By Mr. Hunt:

We object to that because they have gone into it.

Objection overruled.

By Mr. Hall:

I omitted the question.

Q. Now, please answer that question, as to whether it was the duty of anybody else to inspect it but Engineer Andrews?

A. No, sir; our boiler inspectors are required to inspect it every thirty days, once every thirty days, and make a written report.

Q. And between the 11th and the time of the explosion on the 14th, it was the duty alone of the engineer to inspect it?

A. Yes, sir.

CROSS-EXAMINATION.

By Mr. Staples:

Q. Do you mean to say that it was not the duty of that hostler that came in here and said he took a long pole and reached up in there through the soot and smoke and put kerosene oil on a lot of waste, it wasn't his duty to do that, and that he did that voluntarily?

A. We do not require that of them.

[784] Q. That was just his voluntary act, then?

A. He does that for his own protection, in case it was claimed there was an engine damaged.

Q. That is true, that it was not his duty to do it?

A. It is not required.

Q. And when he came in here and testified he did that, he was doing an unusual thing and it was outside of his regular duty, isn't that true?

A. No, sir; it is not unusual; it is common, but it is not required by the company.

Q. He came in here and said he did a thing that was outside the regular line of his duty?

A. He said he did something, and I have no doubt he does it, but it is not required by the company.

Q. Mr. Andrews was not one of the inspectors, except as it was his duty to inspect his engine by looking in there?

A. He is required to inspect all parts of his engine, the

[785] same as all other engineers, by the rules of the company.

Q. I mean he was not a regular boiler inspector?

A. He is not supposed to make a hammer test.

Q. He is not supposed to do any tapping?

A. No; not to go inside the boiler and tap the bolts; but he is supposed to use a hammer where it is necessary.

Q. The full extent of his inspection or duty was simply to poke his head in the fire box and look up and hold his hands over his

eyes?

A. It is his duty to know whether his engine is leaking when it comes in, and if it is, to report it, so that it can be fixed.

Q. Provided he can discover it by the inspection I have just mentioned?

A. He is supposed to know if it is leaking.

Q. If it is leaking anywhere which he cannot discover that way, there may be a difference of opinion whether he could discover it; I say if the engine is leaking anywhere in which he could not discover it by looking in the fire box, he would not be expected to know?

A. We wouldnt expect him to go in the fire box and inspect it.

(Witness stands aside.)

[786] A. KEARNEY.

A. Kearney, sworn, for Defendant:

DIRECT EXAMINATION.

By Mr. Hall:

Q. Mr. Kearney, what is your line of work?

A. I am assistant superintendent of motive power of the Norfolk & Western System.

Q. How long have you been engaged in work as a mechanical engineer?

A. I had four years at Georgetown (academic), four years at Altoona (mechanical), and later while assistant engineer of the United Railroad of New Jersey, which is a part of the Pennsylvania, I took two years electrical course in Brooklyn. While at Altoona, going through a special course, we have the opportunity, or rather the opportunity is afforded us, to get a special training through all the departments of machinery, blacksmith, boilers, and so forth.

Q. In the Pennsylvania shops?

A. Yes, sir; after that my first appointment was that of assistant road foreman of engines.

Q. Of what railroad?

A. The Pennsylvania, between Philadelphia and Harrisburg. I was there about two and a half years in that capacity. I was in charge of engineman and fireman, the operation of engines on the road, hiring and instructing engineers and firemen in their duties. After that I was assistant engineer on the Philadelphia, Wilmington and Baltimore division of the Pennsylvania, and then master me-

chanic at West Philadelphia, of the Pennsylvania, where
[787] they handled all the Pennsylvania interests in Philadelphia.

After that I was assistant engineer at Jersey City for four years, I think. Then they took me back to Altoona as assistant engineer, and after that I was division superintendent of motive power of the P. W. & B at Philadelphia. After about two and a half years or three years I received an offer on the B. & O., and went to Pittsburgh and worked on the Pittsburgh district for about two years as superintendent of motive power, after that I received an offer from the Norfolk & Western Railway Company and I have been here for the last nine years.

Q. As assistant superintendent of motive power?

A. Yes, sir.

Q. In your various positions that you held, have you had practical experience in connection with boilers and crown-sheets and boiler explosions from low water?

A. After training in the shop at Altoona, in charge of boiler work, and while at Altoona, and since that, of course we have had a good deal of work to do ourselves in the way of constructing and repairing boilers and building up a method of doing the work and making our operation standard, etc. We have had or I have had opportunity to see that work in detail, and being in charge of the design, as we find necessary changes should be made in construction, we apply those or consult with the mechanical engineer, and we work out such changes and apply them to the benefit of the service.
[788] In the matter of low water, I have seen quite a number of cases in my twelve or fifteen or twenty years- experience.

Q. Have you examined the crown-sheet that has been offered in evidence here?

A. Yes; quite a number of times.

Q. Are there any indications on that crown-sheet as to what caused its failure?

A. None at all, to my mind.

Q. As to what caused its failure?

A. Not a thing in the world, no doubt in my mind what caused it.

Q. What did cause the failure?

A. I thought you said did I understand or did I know what it was. Yes, there are indications there showing what was the cause of its failure.

Q. What was the cause of its failure?

A. Absence of water over a portion of the crown-sheet.

Q. What are the indications on the crown-sheet itself that show an absence of water?

A. The indications are very clear on this sheet. We have the color of the sheet, the stretching, the shape of the sheet, the position of the sheet, its relative position in the boiler, the appearance on the water side as well as the appearance on the fire side.

Q. Do these things all indicate an absence of water from the top of it?

A. Very clearly, yes.

[789] Q. Have you examined these bolt heads that have been offered in evidence here?

A. Just in a casual way; yes.

Q. What do they indicate as to the cause of the failure?

A. That they were very hot.

Q. Could they have been as hot as they show they were with water on top of the crown-sheet at the time they were pulled off?

A. No, sir; that would be contrary to all of our experience.

Q. What are the indications on those bolt heads showing that the crown-sheet was overheated and that there was no water on top of it when they were pulled off?

A. The color and their shape and the fracture.

Q. What color do the bolt heads have to show that they were heated to a point of failure, as you say those were?

A. Blue.

Q. Do those have the characteristic blue color?

A. Exactly.

Q. What is in their shape that indicates they were heated very hot at the time of the failure?

A. The fracture is characteristic of a bolt broken under heat, the fibers are drawn as against a straight fracture we would have ordinarily, if broken cold. You observe they are broken under the head, which ordinarily is a strong point in the bolt, and the

[790] bolt heads otherwise show that they were hot.

Q. What does the rounding off of those bolt heads, or the convex appearance of them around the shoulder, show?

A. I have never seen a low water case, and I suppose I imagine I have seen probably twenty or fifty or maybe more, maybe seventy-five. I have examined with the Federal inspectors, and in advance of them probably twelve or thirteen cases; I have made my report and they have never contradicted it. In all such cases they have shown the shape of the head very much like that. I say very much like that, as near as one can tell.

Q. Have you ever seen bolt heads that were pulled off or broken cold, take that shape (indicating)?

A. No, sir; I worked on the test machine while at Altoona quite a long time, and I have never been able to do that; on the contrary, I have seen them blown down under heat, a reproduction of this where we got identically the same result, as far as I have been able to see. I have a nut in my pocket that I picked up while we were making an exhibition test, and it is exactly like that, as to the character of the fracture. I mean showing where the fibers have been separated and pulled out, some pulled and some otherwise.

Q. You say you have that nut in your pocket?

A. Yes, sir.

Q. I wish you would produce it.

[791] A. I do not want this nut mixed up with any others, because I have had it with me all the time. I have had it with me, in my sight or in my trunk, never at the shope, since that thing occurred; I picked that up while it was still hot.

By Mr. Staples:

Do you know to what extent it was heated?

Witness:

To a point of rupture.

By Mr. Staples:

A rupture of the crown-sheet?

Witness:

Yes, sir; the crown-sheet of this experimental boiler was ruptured like that.

By Mr. Staples:

Do you call that crown-sheet ruptured?

Witness:

Don't you?

By Mr. Staples:

I asked you. Do you call it ruptured?

Witness:

That is, the sheet is not serviceable.

By Mr. Staples:

I asked you if it was ruptured or not; that is all I asked you?

Witness:

Yes, sir.

By Mr. Hall:

We object to your going into an examination of the witness now.

By Mr. Staples:

I am trying to find whether the conditions were the same, and I want to know if that crown-sheet is ruptured.

Witness:

The crown-sheet is not broken, but it is ruptured from its original construction and shape, the crown-sheet itself is not separated in any of its parts that I can see.

By Mr. Staples:

Isn't that what a rupture means?

Witness:

It has broken away from its original position.

By Mr. Staples:

Don't you mean by a ruptured crown-sheet, a broken crown-sheet?

Witness:

If you wish to put it that way.

[792] By Mr. Staples:

Isn't that the usual term?

Witness:

For a ruptured sheet?

By Mr. Staples:

Yes, sir.

Witness:

No, sir.

By Mr. Staples:

Wasn't the sheet in this case torn and isn't that what you are talking about?

Witness:

This sheet was not torn, Mr. Staples; it is merely a question of what you mean by a rupture. If you want to say that rupture means to sever or tear, then this sheet was not torn. But that is a ruptured boiler.

Mr. Hall, continuing direct examination:

Q. You say the boiler you spoke of was blown down from low water in an experimental test?

A. Yes.

Q. And that is one of the bolt heads you picked up while it was still hot, as soon as the sheet had been blown down?

A. I think I was probably the second man there. Mr. Doarnberger says he was the first, so I have taken second place; but I picked that up while he was standing in front of the boiler.

By Mr. Staples:

Is that the same explosion that was made with bolts that had been in service eight or ten years?

Witness:

No, sir; this was a brand new boiler.

By Mr. Staples:

How long had that been in service?

Witness:

I don't know.

[793] Q. I want the jury to look at this bolt head.

A. The reason I am particular about that, I know the question will be asked if I have had it in my sight all the time, and I can swear that came out of the boiler after it was low in water.

Q. You saw that the boiler was blown down with no water on the crown-sheet?

Q. For the purpose of making the test, you say, to see what the conditions were?

A. Exactly so; I was watching it blow up.

By Mr. Staples:

I do not think that bolt is proper, because it cannot be shown the bolt was in the same condition that those were, and we do not know whether it was a good bolt or a defective bolt. The grade of the iron may have been different, the temperature may have been different, and there is nothing in the world to indicate that the conditions were the same when that crown-sheet went down.

A. If you take that position, none of our experience is worth anything.

Q. What difference, if any, is there in the color of these [794] bolts and the ones there in front of you that came out of

this engine, 469?

A. I do not think any one can see any particular difference, they are practically the same. There is one over there (indicating) very much on the same order; several of them are broken and the shape seems to be the same, generally the same.

Q. And the break is in the same general way?

A. Yes, sir; the curve is the same; the general shape is just as natural as can be, as far as I can see.

Q. Can a bolt be forced in that shape and show that appearance if it was broken cold, that is, with water on top of the crown-sheet?

A. No, sir.

Q. How would you break it, if you could break it, at that point, with water on top of it?

A. You mean under the head?

Q. Yes.

A. You would have to reduce it; you would have to reduce the section under the head and it would not show this fracture.

Q. What kind of a fracture would it show, Mr. Kearney?

A. A clean cut, straight fracture.

Q. Have you had any experience in seeing bolts broken that way, under the head, where the area has been reduced enough to make them break?

[795] A. I did not do it myself, but I got the data and it bears out, it bore out rather, all the calculations that we would have made.

Q. What do the indentations on that crown-sheet there indicate around the bolt heads, as to whether the sheet was hot or cold when it failed?

A. The sheet, particularly in the two forward corners, shows that it must have been very hot, so as to let the sheet embed itself into the head. That is also shown to some extent all over the sheet, and is just about what we would expect even in some colder portions, but it is cut in to quite an extent in the corner of the fire box, the forward end of the fire box. In the rivet line there, is not the hottest part, though the highest, as explained by Mr. Doarnberger.

Q. Does the appearance of the holes there and the threads indicate anything as to whether it was hot or cold when it went down?

A. Those threads show very well that it is pretty soft, but that is not as good as the color line on the water as well as on the other side, or fire side, of the sheet.

Q. Suppose this sheet had been heated so as to cause those bags

between the stay-bolts that are on there, sometime prior to the actual explosion of it, would there have been any indications that the sheet had been burned, when the engine was steamed up and they tried to put it in operation?

A. I do not believe I have your question, but I think I
[796] can answer it—no, it is not clear to my mind, and I will be glad if you will read it again.

(Question is here read to the witness.)

A. That question is not clear to me yet.

Q. What I mean is, and I do not want you to answer any question you do not understand, if that sheet had been overheated some time prior to the time that it actually went down, sufficiently to cause these bags between the stay-bolt holes, would there have been any indication of it?

A. Naturally, we would expect some indication, although it disappears as the bagging takes place. If I caught your question, that answers it, does it?

Q. If it was burned some time prior, and bagged as much as it showed it was?

A. It might have been.

Q. Would it have leaked?

Q. I will ask you this question: If a crown-sheet is burned or overheated so that it will bag as much as this one is in the center, without going down, will it leak?

A. It certainly will leak.

Q. Could an engine with a crown-sheet burned in that
[797] shape be operated and haul a train for a distance of twenty miles?

A. You could not use it at all.

## Cross-Examination.

By Mr. Staples:

Q. Mr. Kearney, suppose an engine is in the yard and it has not a very heavy fire in the fire box, and very light pressure in the boiler and the water gets low and it is heated there under that condition you would expect the crown-sheet to get overheated some, wouldn't you, from this continual fire there?

A. Yes, sir.

Q. It would probably bag some, wouldn't it?

A. I do not think so; not with a roundhouse fire as described by you.

Q. How hot a fire do you think it would take to make it bag?

A. It will take a right brisk fire, but not as described by you.

Q. I am assuming now that it does bag and I am assuming for the sake of the question that it would bag with a little fire.

A. Yes.

Q. Now, if that had been exposed by a low fire down in the yard prior to the time that it was delivered to Mr. Andrews and had been overheated there, would you, or not, expect to find the color indications on the sheet there, the same as they are now?

A. No, sir.

Q. Why not?

[798] A. Because he will have used the engine between the time, I understand.

Q. You think the using of an engine an hour would make a change?

A. Yes.

Q. What change would it make?

A. It would change the color on the other side of the sheet.

Q. On which side?

A. On the fire side.

Q. In what respect?

A. It would darken the sheet and show a rather dark soot on the surface of the sheet.

Q. Do you see any dark soot on it now?

A. Yes, up in the back corners.

Q. You say that you can see soot on it?

A. Up in the back corners.

Q. Where it has been hot?

A. Where it has not been as hot.

Q. If the back corners were not heated, in the yard, you wouldn't expect soot to burn off there in the yard?

A. Your question was what?

Q. Never mind what my question was.

[799] A. But I want to understand you.

Q. It is this: I am not talking about the soot being on the part that never was overheated, I am talking about the part overheated in the yard. It would have soot burned off there, wouldn't it?

A. If you assume it was overheated in the roundhouse and then taken out by Mr. Andrews, it certainly would show soot on the sheet.

Q. Do you see any soot on the sheet?

A. I certainly do.

Q. You have got better eyes than the gentleman who was on the witness stand yesterday, haven't you?

A. Maybe I have.

By Mr. Hall:

What gentleman do you refer to?

By Mr. Staples:

Mr. Sample:

Witness:

Mr. Sample pointed out the soot to me and so did Mr. Doarnberger.

By Mr. Staples:

I think Mr. Sample said he could not find any.

Q. You are talking about the part that has not been hot?

A. Yes.

Q. I am talking about the part that has been hot.

A. Then why didnt you say so.

Q. Tell us whether there is any soot there on the part that has been hot?

A. The part that was hot last?

Q. Yes.

[800] A. That sheet has gone down as the result of heating, and the heating has changed the color, as we find it there.

Q. Do you or not find any soot on the part that has been bagged?

A. No, sir.

Q. You do not, do you?

A. No, sir.

Q. The only place where you can find soot is on the part that has never been heated, isn't it?

A. I cannot say that. It was the cooler portion at the time of the failure.

Q. That is what I am talking about.

A. You did not say that before. I understood your question to mean that was hot at one time.

Q. I am talking about having been heated in the yard. I think you misunderstood me.

A. Maybe so.

Q. The other portion never had been overheated and the soot will be there?

A. I dont' know whether it has been overheated or not.

Q. You don't see any indication of it, the part where the scr t is?

A. There is nothing there to show it has not been.

Q. Did you ever see a crown-bolt broken in an engine with water on the crown-sheet, under the head, like those bolts are, or broken under the head?

A. You are referring, of course, to the button head bolts?

[801] Q. Yes.

A. I imagine there must be about five million bolts of that kind in service in this country, and I have never heard of one being broken. You might ask, how do we know if one was broken out in California; would it be reported? To which I will say that we have means and methods of finding that out. I have never heard of one in my experience breaking cold.

Q. That is not the question I asked you, Mr. Kearney. You said you knew how one of those bolts would look if broken cold, and I am asking you if you ever saw one break that way or not? Did you?

A. Do I understand you to refer to service?

Q. In service.

A. They are never broken in service.

By Mr. Hall:

I did not ask Mr. Kearney anything about being in service. He is asking him questions on the basis of being in service; I asked him about the testing machine.

Witness:

That is what you asked me.

Q. The testing machine is no different?

A. Not a particle.

Q. You do not think it will be, a particle?

A. No, sir.

Q. How about this drum over here, does the color of that drum look the same as that crown-sheet over there?

A. Not exactly.

[802] Q. It looks a little different kind of an oxide?

A. Yes.

Q. This drum was heated to a bright red?

A. Is that so?

Q. Yes; how hot would the crown-sheet have had to have been to have gone down from low water alone?

A. I am afraid that any answer I might give you in connection

with that, Mr. Hunt, where you will afterwards use the term, will be rather misleading to me as it will to you, because the authorities do not agree as to what the colors mean. For instance, Rankin will start out and refer to a bright red; Kent will call it a dull red; Rankin will start out and call the next a cherry red, but Kent will call it a bright red.

Q. And what do you call it?

A. Which do you want it?

Q. Which would you call it?

A. I should say the sheet must have been on the low side, considerably on the low side of our flanging temperature, which we use in the shop, and which is approximately 1600 or 1700 degrees, or somewhere along there.

Q. Do you or not think the crown-sheet would have to be hotter than you heard the gentlemen describe it here?

A. On going down?

Q. Yes, sir.

A. I do not think I can enlighten you on that; I do not know at all; there is oxide on that that is entirely different from what we find of the crown-sheet, due to the way it has been handled,
[803] the way it was heated, quantity of air used in heating; and any answer I might give you would be rather misleading, and perhaps inaccurate.

Q. Mr. Kearney, do you notice any particular difference in the heat to which these bolts were subjected?

A. They are approximately the same; I have heard all of the testimony.

Q. You think they are all the same?

A. I think they are near enough the same. Now, Mr. Staples, in answer to that, I want to say further—

Q. (Interposing.) Don't say anything about bolt No. 9 in your answer.

A. Where you refer to the bolt heads being approximately the same temperature, and to which I agreed, I understand and am satisfied that the highest portion of that sheet, back of the highest portion, the bolts were somewhat hotter than they were towards the side. That is very natural, or rather it is very natural that they should be a little hotter; still I think they were all approximately the same, still those on the side gave way last.

Q. Let me see that bolt that you have got in your pocket.

(Witness hands the bolt to counsel for plaintiff.)

Q. Do you see any particular difference in the appearance of

this?

A. No, sir.

Q. And yet you tell us this bolt was only heated to a dull
[804] red, isn't that true?

A. I don't know.

Q. You heard them say that, No. 9, here?

A. Yes, sir.

Q. That bolt, then, according to their statement, never was heated hot enough to cause a failure of the crown-sheet?

A. Yes, sir.

Q. A dull red?

A. That temperature. I don't know what they mean by a dull red.

Q. I dont' want you to juggle terms with me, Mr. Kearney.

A. Well, don't you?

Q. I want you to tell me some authority that defines a dull red as being sufficient heat to cause a failure in that crown-sheet from low water.

A. I do not know what you mean by a dull red.

Q. Please give me an authority that says it is a sufficient to cause a failure from low water over the top of it. In other words, do you know of any writer on the subject who has advanced that idea, that that degree of heat which would be necessary to render those bolts sufficiently pliable to go down, is a dull red?

A. I dont' know of any; I don't know what a dull red means.

Q. Then I will ask you whether or not if that bolt No.
[805] 9 was heated to a dull red heat, it would be sufficient, or if the balance of the bolt in the crown-sheet were heated to a dull red heat, it would be sufficient to cause them to go down?

A. If a dull red, as defined by whoever is referring to these bolts, as this temperature, it was certainly enough to rupture the bolts, whatever that temperature might have been.

Q. That is not my question. The question I am asking you is whether or not that crown-sheet would go down from a dull red heat? Would it or not?

A. I do not know.

Q. You do not know?

A. No, sir.

Q. You admit that you do not know?

A. I do not know what a dull red is.

Q. Then I want to enlighten you on the subject. Mr. Kent here has defined it.

A. I can tell you what he says.

Q. What does he say about it?

A. He says about 1300.

Q. Why are you trying to throw such an air of vagueness over this dull red?

A. You have Mr. Kent as an authority.

Q. He is a right good authority.

A. Take Barrus or Parsons, they will tell you that the difference in color is so vague that it is only an approximation to start with.

Q. What does Barrus call a dull red?

[806] A. I don't know.

Q. You do not remember whether he is different from Kent or not?

A. He does not give it.

Q. How much does Kent say a dull red is?

A. Approximately 1296; I have read it a half a dozen times since I have been here.

Q. Do you know any author who defines a dull red as being hotter, then?

A. No, sir.

Q. Then we will assume that Mr. Kent is right.

A. No, we won't.

Q. Is he right or not?

A. I do not know.

Q. You do not know he is wrong, do you?

A. No, sir.

Q. Well, just assume he is right if you don't know anything to the contrary.

A. I would rather not.

Q. You will have to do it for the purposes of the question.

A. I don't know what a dull red means. I do know this, that the temperature here is misleading. You ask me if this is a dull red, another gentleman makes an inspection of it and assumes that was beyond a dull red. Now, was that a dull red? If it was, we do not know it. If that bolt (indicating) failed, I know the bolt

[807] and I know it well, it is one that we have been talking about ever since we have been here, and if that bolt was hot enough to rupture like that it must have been very, very hot.

Q. If it was hot enough to rupture like that?

A. Yes, sir; it must have been very hot.

Q. That is your idea?

A. Yes, sir?

Q. You do not think the amount of pressure that the bolt is subjected to has anything to do with the rupturing, but that the heat is the only thing to do with it?

A. If it had been heated and no pressure, it never would have been disturbed like that.

Q. You said the only thing is heat, and not pressure?

A. I did not say that.

Q. I understood you to say, in order to rupture one of those bolts it would have to be mighty hot?

A. You heard my answer.

Q. Didn't you say in order to rupture that bolt head it would have to be mighty hot?

A. What did I say about that?

Q. That is all I heard you say; you must have said anything else to yourself.

A. No, sir; I said it loud enough for anybody to hear. I said if that had been heated to that temperature, as judged by these other men, it does not correspond to Mr. Kent's definition of dull red.

Q. Then you think the fellow who said it had been heated [808] to a dull red, did not know what a dull red was?

A. There was opportunity there to make a mistake in his judgment.

Q. It never was heated to what you call a dull red?

A. No, sir; I think it was beyond that.

Q. You think it was heated hotter than that?

A. Yes, sir.

Q. And you think these other bolts were heated to that same temperature that that bolt was?

A. No; I cannot say that.

Q. Approximately the same temperature?

A. Yes, sir.

## Re-Examination.

By Mr. Hall:

Q. This bolt head that has the figure 9 on it, does it show by the way it broke or indicate that it was hot when it did break?

A. Yes.

Q. If it had not been hot at the head of it sufficiently to weaken it under the head, where would it have broken?

A. In the body.

RE-CROSS-EXAMINATION.

By Mr. Hunt:

Q. What percentage, do you suppose, of the engines in
[809] service today on your road are in service with bagged conditions or corrugated conditions between the bolts?

Defendant objected. Overruled. Exception.

A. You understand that Mr. Doarnberger and I have talked this over and over a number of times; in fact, we were together and I think you came over and talked to us about it.

Q. Yes.

A. The figure given by Mr. Doarnberger, which I think was twenty-five or thirty engines, is a figure that I won't dispute.

Q. It is true that engines in that corrugated condition are in service now and do not leak, isn't it?

A. I want to make myself clear on any answer I might give. As soon as the crown-sheet begins to corrugate, the tendency to leak begins at once. Now, they will leak and we often find it possible to take them up by corking. If they are too bad, and I cannot define what "too bad" is, nor can any boilermaker in this country do it, they will leak more. Now, we have boilers in service and I have seen a number that we have gone over and taken up the leaks as they had corrugated, some corrugate from one thing and some from another, and again some from material on the crown-sheet. That is very clear and just as natural as can be.

Q. And others from low water?

A. I have seen them from low water; in fact, I have been in them after low water.

Q. And they were used and in service, and they are to-
[810] day, are they not?

A. I do not know of any in service; I know they have been put in service, because I have been in them and helped to do the work, and have ordered them back in service.

Q. The extent of the corrugation, or leaking rather, depends upon the extent of corrugation, doesn't it?

A. Yes, sir.

Q. Then, if I understand you correctly, Mr. Kearney, the crown-sheet may be weakened by a previous burning and become corrugated and not leak, and in service now, that is true, isn't it?

A. I think I can answer it this way, just what you want. They will corrugate, and if you are successful in taking up the leaks

you can continue them in service, because the material itself in the crown-sheet has not been damaged or injured except in the shape of the sheet, as it changes from the natural or original arch.

Q. Do you agree with Mr. Doarnberger that heating contracts and takes up the leaking, or that heating expands, retakes up the leaks?

A. I think Mr. Doarnberger thought that you were talking about the bolts while he was talking about the sheet, and when he was talking about the sheet you were talking about the bolts.

Q. Is it contraction or expansion of the bolts or sheet that takes up the leaks?

[811] A. I will try to be right careful in my answer because it is my opinion. You appreciate that the arch is slightly crowned in its original shape.

Q. Or that the crown is arched, which?

A. The crown is slightly arched; I mean that it is very slightly arched, so much so that in putting the bolts in, the bolt heads strike the crown fairly. Now, as long as that sheet is in that shape, in that crowning shape, and is heated, it is my personal opinion and from my observation at the shops in handling engines that the tendency will be for that sheet to squeeze the bolt, because it expands inwardly and goes toward the bolt, while the bolt is going towards it. Now, if that is slightly arched, inverted—

Q. (Interposing.) You mean bagged?

A. Pocketing is better. I believe, and it seems to me any engineer will agree that as that expansion takes place it is pulling away from the bolt?

Q. Pulling away?

A. Downward; because in the arch it finds its relief by increasing the pocket.

Q. As long as the bolt head is in it, it does not expand towards up to the bolt or does not the expansion of the bolt drive it to the sheet?

A. When it is up near a straight line or when it is near its original construction.

Q. Can you put it in that position? That is not true, and you cannot do that to save your soul, can you?

A. I think so.

[812] Q. Explain that to the jury, how you can put it in that position, that the heating of iron will not cause an expansion and drive the sheet towards the bolt and the bolt towards the sheet?

A. This is the arch or a part of the crown-sheet, the rest comes this way, but for illustration I want to take this center part here (witness indicating on blackboard). I want to put two button-head bolts there. Now, this is the pocket (indicating), here we have one side to illustrate first the shape of the sheet in its original construction. Now, as this material between the stay-bolts expands, I believe and I feel satisfied and I think any one will agree with me, that it is going to hug the bolt, the bolt at the same time is swelling and it is meeting the expansion of that sheet over here (indicating). We have an exaggerated pocket as this is expanding. It is certainly finding relief in this direction or in any other direction. The bolt is expanding and is going as far as it can in that direction, at the same time the pocket is taking a position where it can find relief in the pocket without leaving the bolt.

Q. Is that your explanation of it?

A. Yes, sir.

Q. Isn't it true, by your explanation, and don't you make your iron expand here, and denying it the right to expand at this point?

A. It finds relief by coming away from it.

Q. Regardless of the relief which iron finds when you heat it, won't it expand in every direction?

A. Yes; that is so, but it goes in the direction where it [813] gets its relief.

Q. Doesn't it also go in the other direction?

A. It is not getting relief up here (indicating), because it is meeting a bolt expanding and will not make a tight fit.

Q. It will go in the direction (indicating), that direction, as long as it can get relief?

A. Depending on how it hangs, or the extent of the pocketing, down here (indicating).

Q. Regardless of where it hangs, the reason it doesn't go here is because it cannot find relief. It will go in that direction until it gets to the bolt?

A. Unless it finds relief in here (indicating).

Q. That doesn't get any relief in that iron?

A. Yes.

Q. If you crook a nail and heat it, won't it expand here as well as where it is crooked?

A. Yes, sir; but it always getting its relief in the crook.

Q. How about the other part of that nail, as well as this (indicating)?

A. It is, but your joint here (indicating on crown-sheet) is

impaired, your material is out of shape and it will not give you a good joint around the bolt. It does not matter how you expand it, it will not give you a good joint in service.

Q. If you pull this piece of metal from that bolt at that
[814] point and bag it, don't you naturally throw the lower end of this sheet nearer the bolt by pulling the top end away from it?

A. Not necessarily, I do not think you can say that.

Q. Is it possible to pull the top end of it in that angle away from the bolt without throwing the lower part of the sheet closer to the bolt?

A. I do not think it is so.

Q. It is not probable?

A. No, sir.

Q. Would you say it is possible?

A. I do not know.

Q. Hardly possible, is it?

A. Not hardly possible.

Q. If you do not think you can do that, dont you throw a tighter joint here?

A. No, sir; you do not.

Q. I thought you said it was not possible to pull it here (indicating)?

A. I was referring to the lower part.

Q. If you pulled the lower part away by the angle you have there?

A. No, sir.

Q. You never saw a condition like that on an engine?

[815] A. No; but I can make one; you should not criticize my picture.

Q. I am not criticizing your picture, but I want you to draw it so that the jury will understand it better.

A. (Witness here draws it on blackboard.) There, something like that will be better.

Q. Do you desire that joint to be closer there?

A. Any way you fix it.

Q. Fix it near about right.

A. It is just as natural as can be, when you press this down (indicating) you are pulling away from the joint, by pulling this away from the bolt.

Q. The tendency is to shove the lower end closer to the bolt?

A. By expansion I would say no.

Q. By expansion or dead weight?

A. I wouldn't say so.

Q. Didn't you do it by that very act there?

A. I wouldn't say so. I think you have forgotten this (indicating); this has come down by reason of the temperature, and the pressure has pushed it down and it has gotten in that shape and I do not believe that has changed the normal conditions here (indicating), except where it is drawn out to the extent of pulling it away from the thread.

Q. If it is pulled down in that way, don't you get a corresponding curvature of the bolt wherein the thread penetrates the sheet?

A. No; I wouldn't say so, but I would say this, we are [816] speaking of a normal condition, are we not?

Q. Yes, sir; but I imagine that is a little abnormal, the pocketing there (indicating).

A. I wouldn't say all of this is abnormal.

Q. Any pocketing is abnormal, is it not?

A. We are speaking of the drawing.

Q. When you get a pocketing in your sheet you have got an abnormal condition?

A. Yes. Now, that is only three-eighths, and that (indicating) is more than an inch across here (indicating), and down here (indicating), it is about half an inch; it is all exaggerated here, of course.

Q. I am not criticizing your drawing, but criticizing the use of your term "abnormal", and that when you have got pocketing in a sheet at all you have got something abnormal.

A. Yes. I want to make this clear, it is abnormal to the extent of the general construction of the boiler, but we do have engines in the service that have that and we consider to that extent it is good practice, I think that is clear, is it not?

Q. I think so. Now, if I understand you, in order for this pocketing in the sheet to expand in this direction and not in the direction there, you would have to have a pocket lower than any pocketing as shown on that plate, wouldn't you?

A. Repeat that again.

Q. In order for your expansion, your theory of expan- [817] sion, to find the least resistance at the bent position of the iron and not expand here (indicating), and there (indicating), you would have to find a lower pocket than you can put your hand on, on that sheet, wouldn't you?

A. No.

Q. Do you think that there is a pocket on that sheet that would, in your theory of expansion, or in the process of expansion, I mean,

that would go down and not out this way (indicating)? Is that possible?

A. Yes, sir.

Q. Which pocket?

A. In the natural stretching of that sheet you have distorted all the holes.

Q. But that is after it was blown down?

A. Yes.

Q. But I am speaking of pocketing prior to going down.

A. It is something like that, I imagine; I have no reason to believe otherwise, and further, that the pocketing made it loosen up the joints here (indicating).

Q. And you think the heating of this iron would not tend to shove it out towards the bolt?

A. Yes.

Q. It would?

A. I said that.

Q. I thought you said it would not?

A. I said in both directions.

Q. I understood you to say it would not expand here and there, but would expand there (indicating)?

[818] A. No, sir.

Q. You now tell the jury it will expand there and there also (indicating)?

A. Yes, sir; didn't you ask me if it would expand in all directions, and I told you yes.

Q. I thought you said in the line of least resistance?

A. It would get relief in that direction.

By Mr. Hall:

Q. You have asked a lot of questions there about expansion and contraction of materials, from a practical standpoint, when a crown-sheet is burned or overheated to the extent that it bags between the stay-bolt holes, does it leak?

A. It certainly does.

Q. And do these leaks have to be stopped up before it can be put in service?

A. I tried to make that clear in the beginning.

Q. I want you to make it clear again.

A. As soon as the sheet begins to corrugate, you are increasing the opportunity to leak.

Q. I know you have explained that thoroughly, all I want to

know is whether in actual practice it does leak?

A. It absolutely does.

Q. And is it necessary to stop it up before you can put that engine in service, I mean if it is burned to any considerable area?

[819] A. I will answer that one way and you come and ask it another way or you ask something else. There is a condition of leaking that will not necessarily kill the engine, but it must be very, very small. If there is any leak to amount to anything, you have got to stop your engine, though when you asked me if there is any leak, I must be absolute in my answer.

Q. My question is this, if the crown-sheet is corrugated by overheating, without water on it, over an area 3½ feet on one way and 4½ or 5 feet the other way, can that sheet be put in service until those leaks have been stopped?

A. In my experience of fifteen or twenty years, and having been in a number of them, I will say I have never seen it done, I cannot imagine how it could be done.

By Mr. Staples:

Q. If a crown-sheet goes down on an engine at the same time that the water glass shows an inch from the top, or very soon after that, or in such a short time after that that the water could not be consumed in the engine, would that or not, indicate that the water glass was in an improper condition or that the sheet went down not from low water?

A. I know, but it is not a fair question.

Q. Read the question.

(Question is here read to the witness.)

[820] A. Mr. Staples, a crown-sheet cannot go down if it has water on it, that is No. 1. If you ask me the question if the water glass shows there is water on it, it is a false reading, that is No. 2.

Q. And the water glass is not in proper condition?

A. The water glass shows a false reading, and will not agree and does not agree with the guage cocks.

Q. And is not in proper condition?

A. I won't say that.

By Mr. Staples:

Q. Mr. Kearney, what is the effect when a crown-sheet is overheated and water is put back on the top of it, that does not blow it up, does it, does that cool off the crown-sheet?

A. That has been disputed among enginemen quite a good deal.

There are some engineers today who will tell you that will happen, but the best information I have on that is from experiments made at Altoona by a mechanical engineer, Mr. Collins, and it was afterwards duplicated, the test showing that it would not cause an explosion such as we have here, and as has been described.

Q. But when that other experiment was tried you thought it would do it?

A. That was before my time, Mr. Staples.

Q. That was the general opinion, though, amongst people, that that would happen, wasn't it?

A. Yes, sir; but I firmly believed Mr. Collins' experi-
[821] ment.

Q. When they tried the actual experiment they showed that everybody was wrong about it?

A. That experiment certainly did.

By Mr. Hall:

Q. You are talking about what the general opinion was among engineers?

A. I said enginemen.

Q. That the idea was, that if a crown-sheet was hot and cold water was put on it, that would cause an explosion?

A. Yes, sir.

Q. That was the idea?

A. But that idea was exploded by Mr. Collins.

Q. And you say Mr. Collins made a test and showed that if the crown-sheet was actually hot and cold water put on it, that that of itself would not cause an explosion?

A. Yes, sir.

[822] J. R. HUBBLE.

J. R. Hubble, sworn, for Defendant:

DIRECT EXAMINATION.

By Mr. Hall:

Q. Do you work for the Virginian Railway Company?

A. Yes, sir.

Q. Where?

A. Victoria.

Q. In what department?

A. In the mechanical department, boiler inspector.

Q. Have you taken the plate off engine 469?

A. Yes, sir; I have.

Q. When did you do it?

A. This morning about 1 o'clock.

Q. Is that the maker's plate you have in your hand, that came from engine 469 of the Virginian Railway Company?

A. Yes, sir.

By Mr. Hall:

I desire to offer this in evidence but I do not want to leave the plate here but just want to read it to the jury.

Said plate is here introduced in evidence, or the reading thereon, as Exhibit I, and is as follows:

"Baldwin, Class 1246-1/4-E-28.

| | |
|---|---|
| Steam test | 220 Pounds |
| Water test | 267 Pounds |
| Working Pressure | 200 Pounds." |

[823] Q. You took that plate off that engine about 1 o'clock this morning, did you?

A. Yes, sir.

[824] J. E. KIRK.

J. E. Kirk, affirmed, for Defendant:

DIRECT EXAMINATION.

By Mr. Hall:

Q. You were asked the other day to take two of those bolts and remove the bolts from the plate. I wish you would state how you did it.

A. You have got that kind of mixed up. I took one out one way and the other another way. The one that the threads have been stripped on, I think this is the one (indicating), I held it in my hand like that and hit it with a hammer and it came off very easy. The one that the threads have not been stripped on, I laid it on an anvil, on the square that way (indicating), and tapped it up here and of course that loosened the thread and it came off part of the way, and when it came up to about one-fourth of an inch from the head, it wouldn't come any further, the thread had been spoiled somewhat, then I took it this way and tapped it and it came off.

Q. You pulled it off, in other words?

A. Yes, sir.

Q. Would the driving it off, the one that the threads have not been stripped on, have a tendency to injure the thread?

A. They had stripped before and they had no effect, it did not take hard enough blow to affect the threads, if they had been holding properly.

Q. How about the last one, the one you did drive?

A. I could not drive it off that way, because the threads
[825] had not stripped at all; it was tight and I had to screw that partly off before it would drive.

Q. Did the driving it off in that way injure the threads any?

A. It may have to a certain extent.

Q. What is your business?

A. I have followed the working of iron and wood for the last thirty years.

Q. Have you had enough experience in iron to know how iron looks when it is heated to a hot heat?

A. I think so.

Q. I wish you would look at these bolt heads and say whether they have been heated to a hot heat or not?

A. Yes, sir; I would say that they have.

Q. What indication is there that they were heated to a hot heat?

A. Well, they are blue.

Q. Does the break, the way they broke, indicate whether they were hot or not when they were broken?

A. The indications are that this bolt was hot when it broke.

Q. Why?

A. The way it broke off and pulled out of the head, if the bolt had been cold—I have pulled the heads off thousands of bolts in putting them in, and I never had one cold but what broke off square right under the head. The bolt to break in that shape would have
[826] had to have been softer down under the head or it would have broken square off.

Q. Why is that?

A. Well, iron will let go at the softest place or the weakest point. Now, the indications are, of this one, that is hulled out when it was a little hotter right there (indicating) that what that bolt was, because it let go at the weakest point, and therefore it must have been hotter there than it was further up.

Q. You haven't had any experience with railroad locomotive boilers, have you?

A. No, sir.

Q. Does the color of that sheet there indicate whether it was hot or cold?

By Mr. Hunt:

He said he hasn't had had any experience.

A. I am speaking of the color from my experience with iron, and the indications of that sheet is that it has been hot.

Q. What are the indications that it was hot?

A. The color of the sheet is one indication, and another indication is that the scale on the water side is all left, about the shape that line has been drawn on there. I have noticed and observed a thing like that, and my first observation was in a tea kettle when it went dry, the scale on the inside will pop off, just like grease would when it was too hot, and then I have noticed it in putting a piece of
[827] flat iron in the forge, when it gets to a certain heat that the scale on the top side will commence to fly, and it has flew up and hit me in the face, until it has all left the sheet with the exception of around the edge and at the corners.

CROSS-EXAMINATION.

By Mr. Hunt:

Q. Where are you from?

A. Christiansburg.

Q. Do you live here now?

A. Yes, sir.

Q. How long have you lived here?

A. I have been here five years.

Q. Where did you live before you came here?

A. I was in Halifax County, Virginia, three years.

Q. Your native state is where?

A. Pennsylvania.

Q. You never did work for a railroad company or have anything to do around boilers?

A. No, sir; but I have worked around boilers and put in flues.

Q. In railroad locomotive boilers?

A. No, sir; stationary and portable and traction engines.

Q. Such work as a blacksmith would get on portable engines passing by?

A. Yes, sir; I have worked on portable, stationary and traction engines, but I have never had no experience on locomotives on rail-

roads.

Q. You never worked in any boiler works, and the only
[828] work you did was in a blacksmith shop?

A. That is all.

Q. You have done a good deal of carpentering work?

A. I have done considerable carpenter work too, wagon work and buggy work.

Q. Your main work is wagon and carpenter work and blacksmith work?

A. Yes, sir; I never worked on any railroad locomotive.

Q. You undertook to tell us about the soot on that sheet. Don't you know that when iron is stretched that the soot will leave it just the same as if it was heated, I mean if it was stretched?

A. Not clean, no.

Q. It loosens all the soot?

A. But it will be in little spots, that has been my experience.

Q. Wherever it stretches it will loosen it up?

A. Yes, sir; but it will not take it off clean.

Q. There is no reason why it should not drop off then?

A. It will not all drop, it will not brush off either; you can take a brush and you cannot rub it off.

Q. Did you ever try to clean a locomotive?

A. Yes, sir; but not on the railroad; but I have others.

Q. I mean locomotives.

[829] A. No, sir; I never was in one; but I suppose the soot would be the same in a railroad locomotive as it would be in a traction or a portable engine.

Q. You don't know the difference in a crown-sheet, the size of the sheet, the size of the bolts which support the crown-sheet; you don't know whether a stationary engine or a portable engine has sheets of that size in it?

A. I have seen them three-eighths of an inch thick, but not as big as that, but made out of as thick material.

Q. You spoke of a mark around the sheet. Don't the stretching of the iron make a mark around it?

A. No, sir; I had reference to that chalk mark.

Q. You looked at the chalk mark and you say you can tell it?

A. Yes, sir; but I had the line, and the line that was drawn there is, I suppose, within an inch of where I was going to put it myself.

Q. If you were going to put it on, you would put it different to that?

A. Very little.

Q. You would sure put it an inch different from him if you were going to put it on here?

A. You can take that off and I will put it where I think it is.

Q. I believe you said if you were going to put it on you would put it about an inch different?

A. In some places I might make it an inch.

[830] Q. Didn't you say you might make it an inch different from what it is there?

A. It might vary in places, I do not suppose he could put it back in the same place, not exactly; no man living could.

Q. Then even if he follows what he considers the burned area he could not put it back in the same place?

A. Not exactly, to a fraction of an inch, that would be an impossibility for a human being to do.

Q. Then it is just sort of guess work?

A. You know that; you know you couldn't.

Q. It is just sort of guess work, after all, isn't it? You mean it is sort of guess work and you cannot be accurate?

A. You have got to go by the soot on one side and the scale on the other, that is all you can go by.

Q. Do you mean to say that a man cannot take a chalk mark and draw what he thinks is the soot and scale?

A. He can draw where he thinks that water was when it went down.

Q. And you would place it an inch above where he has got it?

A. I might.

Q. Then the line is not so plain that a man can see it?

A. Not that he could follow it to one-sixteenth of an inch.

[831] Q. You said about an inch.

A. It might vary in some places an inch.

Q. Do you think that the man who originally put that mark on there, if he was to go and put it back, would vary it about an inch?

A. I do not think anybody could put a line on a piece of iron like that with chalk and rub it off and put it back exactly at the same place.

Q. There is no such thing as accuracy, when you speak of accuracy in placing that mark on there?

A. I do not think the man who put it on before was exact as to the point of water; that is, to a sixteenth of an inch.

Q. He couldn't tell it and you couldn't tell it, and you don't think any other man could tell it?

A. I couldn't tell it to a sixteenths of an inch, and no other man could.

Q. Why do you jump from an inch to a sixteenth of an inch?

A. Because there is places on that boiler that it would be pretty hard to tell just exactly even to an inch where the water was.

Q Even to an inch?

A. Yes, sir; even to an inch.

Q. Mr. Kirk, the hotter you heat iron the redder the oxidation, isn't it?

A. The hotter you heat it, of course, it changes its head
[832] from dark heat up until you get a welding heat.

A. A welding heat is not a red heat at all, that is a white heat, isn't it?

A. Yes, sir.

Q. And the hotter you heat it the redder the oxidization that is left on the iron?

A. You mean while hot or cold?

Q. No; when it gets cold, it has got to get cold before it will oxidize.

A. The burned color that it is called, has some resemblance to red.

Q. Iron cannot oxidize while it is hot?

A. No, sir; after it was cold.

Q. Then you did not misunderstand me?

A. No, sir.

Q. The hotter you heat iron the redder the oxidation, isn't that true?

A. No, that is not correct for the simple reason, if you heat that iron too hot the oxidization will not show in the cold when it is exposed for some length of time. You can take a piece of iron and heat it to a welding heat and—

Q. (Interposing.) What is oxidization?

A. It is the rust that forms on the iron after the heat has left it.

Q. If iron is heated to a red heat, you have your blue scale on it, don't you? That is a fact, isn't it?

A. You mean if it is cool?

[833] Q. Yes.

A. You can heat it to a red heat and welding heat, and let that hot iron stand and let it cool and lay it in the dry for a year and it will be blue one year or two years after you have laid it down.

Q. Then you do not think a year or two would make any difference in the color of it?

A. I mean if it is in the dry.

Q. If it is kept out of the rain a couple of years it won't make any difference in the color of it?

A. Very little difference.

Q. This sheet, they told us, has been kept out of the weather and there were some of them here complaining of the mark being gone by reason of the lapse of time. You don't agreee with them, do you?

A. I tell you I have had experience, and—

Q. (Interposing.) Just say whether or not that is true?

By Mr. Hall:

Let him finish his answer.

A. My experience with iron where it is kept in the dry—

By Mr. Hall:

One minute. Mr. Hunt is making him his own witness on these questions, as I did not ask him anything about that and I do not think he ought to cross-examine him.

By the Court:

Go ahead.

A. I am talking about heated iron that is kept perfectly
[834] dry from the time the heat left it until the time of examination, let that be six months or a year or one day.

Q. If the damp conditions or wet conditions remain away from it, it will be the same?

A. It could be possible that a piece of iron left in a room with the window up, the atmosphere—

Q. (Interposing.) It would have to get moisture?

A. Yes, sir; or it would practically keep its color.

Q. The same color for two or three years, wouldn't it?

A. Yes, sir.

Q. They tell us that sheet, some day, went down with water on it, and they say that ever since they have had it in a house and wrapped it in paper, if that is so you think it ought to keep its mark for two or three years, don't you?

A. It has, the indications are there.

Q. Some of the mark is there?

A. It is there, it is plain to be seen now.

Q. It wouldn't make any difference whether that was heated yesterday, the day before, or two years before, the mark would be there, wouldn't it?

A. Yes, sir; the mark is there.

Q. And no living man can look at that sheet and tell when that heat was applied there, can he?

A. I see what you are after.

Q. You do?

A. I will answer that question in this way: If that iron
[835] had been heated and allowed to cool in the locomotive with water up on the sheet and reheated, that is a different proposition altogether.

Q. Suppose it had been heated and never allowed to re-cool, how about it then?

A. It would be hot yet.

Q. I mean until it went down, and never allowed to cool until its failure, then you couldn't tell what time the heating took place, could you?

A. It will be practically the same color, or should be.

Q. You said you understood me and you answered me as if you thought I had meant to keep the iron hot up until now, you knew I didn't mean that, didn't you?

A. I know you got it backward.

Q. You knew I didn't mean that, and you answered it as if you thought I did mean that, didn't you?

A. No, that is not what I thought; I thought you were coming to the question of putting water on it, and reheating it.

Q. No, I am not talking about that.

A. Whether I could tell whether it had been reheated after it had been cooled.

Q. Suppose it had been heated by a hostler and never allowed to cool until the accident, the point where that hostler had heated it would mark it plainly today, wouldn't it, if it had been kept out of the weather conditions?

A. Not if he had put fire in it afterwards.

[836] Q. If you did not allow it to cool?

A. It would not make a bit of difference if he put the water over it, if he first heated and burned it before, if he put it in fifteen minutes after the water went over the sheet.

Q. And that mark would still be there, wouldn't it?

A. Not if it was reheated?

Q. Suppose it was not reheated above the temperature wherein it received its mark, how about it?

A. If he put fire in there it would soot—

Q. (Interposing.) I am not talking about soot, I am talking about the mark on the iron, or the color on the iron. Then if it had

been burned and the engineer gets hold of it, you do not think he could look up under it and tell it because the color was the same as before?

A. He couldn't tell by the color because it would be sooted over.

Q. How long would it take to cover it over with soot?

A. Ten or fifteen minutes.

Q. Ten or fifteen minutes?

A. You do not understand me.

Q. I do not reckon I do.

A. I don't believe you do or you don't want to. Now, you take a sheet, a boiler sheet, the crown-sheet in a boiler, and let that hostler in the roundhouse burn that sheet and it did not bag between the stay-bolts in burning it sufficient to loosen the stay-bolts for it to leak, the soot will leave the sheet in the absence of water, he may dis-
[837] cover that, he may find his boiler with water and he may refire it or stir up his fire, and that sheet will soot over just the same as it did before the water had left it and you couldn't tell it by looking at it, if it wasn't bagged or no leakage.

Q. When it went down under the giving way of the bolts that soot would leave it, wouldn't it? It would be bound to do it, wouldn't it?

A. No; by bending the sheet it would not take the soot away.

Q. Then you mean to tell this jury that the stretching of iron won't remove the soot?

A. I mean to tell this jury that the heat of the sheet with water on it, that it won't remove the soot clean, as you can see a blue cast like that (indicating).

Q. Let me understand you. Do you mean to tell this jury that soot put on a sheet fifteen minutes or an hour before, that the stretching of the sheet does not remove that soot?

A. You can not pound it off with a hammer; I have tried to do it; you can strike the side of the boiler and you can not do it.

Q. What is soot?

A. It is the carbon that comes from the coal that gathers on it.

Q. It is the accumulation of the smoke from the coal, isn't it?

A. Yes, sir; and there is a certain proportion of it carbon.

[838 Q. You find soot in chimneys where you burn fire, don't you?

A. Sure.

Q. You find soot wherever there is a fire, don't you?

A. Sure.

Q. And the same kind of soot that forms in fifteen minutes on

a piece of iron would be removed as easily as you could sweep the soot from a chimney, wouldn't it, in the fifteen minute formation?

A. I do not think so.

Q. Do you tell the jury it will not?

A. Let me tell you my experience.

Q. Do you tell the jury it would or would not?

A. I say it would not sweep off very easily, because soot is a hard thing to sweep off, any man that has had anything to do with it will tell you it is a hard thing to sweep off. I have wished many a time that I could sweep it off clean, and I have gone into a boiler and swept it and tried to get it off, and when you come out you are as black as a nigger.

Q. You told Mr. Hall that these bolts looked like they had been heated?

A. Yes, sir.

Q. Suppose they had been wrenched from their position on the flue-sheet and fallen into a hot fire, such as is in that engine, what would it do to them?

[839] A. They would be burned.

Q. Would they be just like they are now?

A. If they were left there a certain time, if you left them there quite a while they would be different from that, or they would finally burn up.

Q. Suppose they were left there, what would they do?

A. If you take them and throw them into a fire, they would turn the same color as that after you took them out.

Q. You couldn't look at those bolt heads and say whether they had been laying in the fire, cold or heated?

A. Not by that, but the way they look I could tell that they had been hot.

Q. You couldn't tell when it was broken?

A. No, sir.

Q. And you couldn't tell whether they had been previously heated, or heated on any particular date, could you?

A. I couldn't tell you whether they were off that boiler or not, as far as that is concerned.

Q. And further, you couldn't tell when they were broken, whether they were broken by previous heat, or broken by subsequent heat, could you?

A. No; I couldn't tell that.

Defendant rests.

By Mr. Staples:

I want to ask Mr. Slayton one or two questions.

[840] F. T. SLAYTON, RECALLED.

F. T. Slayton, recalled, for Defendant:

By Mr. Staples:

Q. I believe you told us in Roanoke in the trial in the Federal Court that the water glass is an appurtenance of the boiler of an engine?

A. Yes, sir.

Q. Please state whether or not it is customary among engineers and all engineers in service know that it is customary among them and that they do actually perform the duty of inspecting their water glass and testing it before they start out on a run?

[841] (Manuscript page 841 marked out.)

[842] JOHN DOARNBERGER, RECALLED.

John Doarnberger, recalled, for Defendant:

By Mr. Staples:

Q. What is the lowest that you have ever seen an indication of water having been on the crown-sheet from an examination after a failure?

A. The lowest I believe I ever saw was, I guess it was at a low water test conducted at Coatesville, Pennsylvania, in May, I think, 1912; that was a low water test conducted by Professor Goff.

Q. How low did it get below the top of the crown-sheet?

A. I think it was twelve and three-quarter inches at the front.

Q. How low did the water get on that engine that blew up with Mr. Linkous near Roanoke about a year or two ago?

A. I think it was—I am not positive about that.

Q. I mean that Mallet.

A. Between Bluefield and Walton?

Q. Yes, sir; they had the sheet in Roanoke.

A. If I am not mistaken it was six and five-eighths, but I am not sure now; I cannot remember it, but it was somewhere in the neighborhood of that.

Q. Wasn't it ten or eleven inches?

A. No, sir; I say what I have said, about six and five-eighths

inches.

Q. Didn't you say to us down at the shop, when we were down there that day and when you were showing us these things that the water got eleven inches on that crown-sheet?

A. I cannot remember all that now.

[843] Q. I want you to think about that a little.

A. I have thought about it; I say along about six or seven inches.

Q. You are positive of that, are you?

A. It might be a little more or a little less.

Q. How low does the low water mark that you have pointed out by that chalk line indicate this one was?

A. About two inches.

RE-EXAMINATION.

By Mr. Hall:

Q. In actual experience, isn't it a fact that crown-sheets of engines fail at varying degrees of low water?

A. Yes, sir.

Q. What does it depend on as to how low water will get when it will fail?

A. The one that I referred to at the low water test at Coatesville, it was made for the purpose of demonstrating just what low water would do when it blowed clean down from one end to the other. The Linkous boiler, which I referred to, between six and a half and seven or probably six and a half, blew down the whole length of the fire box, and this one that I referred to, has two inches, probably took two-thirds of it; it varies according to the unexposed surface; the greater the surface exposed the greater the damage.

Q. And does the time it is exposed have anything to do with it and the kind of fire it has under it?

[844] A. Yes, sir; there is variations; it depends altogether on how he is handling his engine at the time. A great deal depends on how the engine is being handled; some of them will evaporate more rapidly and get to a point and the lower it goes when it fails the greater the disaster.

By Mr. Staples:

Q. As I understand you, that Linkous sheet, the bolts held that in shape while the water was being evaporated to whatever you found it; that is, your ten inches, those bolts held that crown-sheet up while it was going down and down to whatever it went, isn't that true?

A. If he worked his engine right and his water was getting away from him, his sheet was uncovered from one end to the other, and the whole thing went down, not like this, this was only back about two-thirds of the way, his was clean back. I think that engine has got a three-inch drop and that would give him at the lowest point about three and a half inches below at the lowest point and six and a half at the highest point, and his crown-sheet went down the full length of the fire box.

Q. The whole thing went down, the whole business?

A. Yes, sir.

Q. Not until it had twisted in all kinds of shapes?

A. No, sir; it just had an even back.

Q. Isn't it like somebody had crumpled up a piece of paper?

A. No, sir; it was even back the whole length of the fire box, I think it was the eleventh row on the left hand side and about
[845] the twelfth on the other. His boiler was probably on the little leaning grade, leaning to the left, and that made it go down between the eleventh and twelfth row on the other side, I mean on the right side. His boiler went down the full length, but the same as that, it just bagged like that, and it pulled a part of the flue-sheet over like this one and part of the door.

Q. Just answer my question. There is no use in telling so much, and we are taking up time. I will ask you what had been done to that crown-sheet when we saw it? It was crumpled up then. Wasn't it all bagged up and wrinkled in all kinds of ways? Had anybody done anything to it since it was taken out of the engine, when we saw it on the yard?

A. You saw it in the yard?

Q. Yes; in the yards in Roanoke; it was piled up on a sort of a car.

By Mr. Hall:

Who saw it?

Witness:

Was I with you?

Q. I think so.

A. No, I wasnt' with you; I never went out of my office with you.

Q. Either you or one of the other men went?

A. I don't care if it was one of the other men; I never went out of my office with you.

Q. Maybe it was not you.

A. No, it was the other fellow.

[846] Q. You saw it after it was down there?

A. I saw it and I have explained it just exactly how it is; it gave way between the tenth and eleventh bolt on the right side and the eleventh and twelfth bolt on the other side, down in the center, the full length of the box.

Q. I asked you if anything had been done to it?

A. I couldn't tell what condition you saw it in.

By Mr. Hall:

Q. That was on a passenger train, wasn't it?

A. Yes, sir.

Q. And being worked very differently from a freight train?

A. Yes, sir.

Q. Did that make a difference?

A. Yes, sir; he was taking the steam from his boiler at a more rapid rate and then he was lifting his water more rapidly. The faster you run the more steam you are using and the greater evaporation; it is quicker.

By Mr. Staples:

Q. It depends on how fast he was running and how fast the other train was running?

A. He was using his steam faster.

Q. And whether he was pulling up hill or down hill, and the load he was pulling?

A. He was, if I remember rightly, on a level, just about to ascend a grade.

Q. And he never had near as heavy a load as the crown-

[847] sheet had there with eighty freight cars?

A. I don't know about that. He had a tremendous train that morning; he had one steel mail, one combination white; he had three cars, one wooden cafe car, two steel coaches and Pullman. I forget what that train was or what the capacity was, but it was very heavy.

Q. Do you think that passenger train was about as heavy as an eighty-car freight train?

A. No, not quite as heavy; but it is a pretty heavy train.

## PLAINTIFF'S REBUTTAL EVIDENCE.

Rebuttal evidence offered on behalf of Plaintiff:

[848] L. S. RANDOLPH.

L. S. Randolph, for Plaintiff, in rebuttal:

DIRECT EXAMINATION.

By Mr. Staples:

Q. Does the heat or temperature of a boiler have anything to do with whether or not it will leak? In other words, will the expansion due to heat close up a hole that would leak if the boiler were cold?

A. I have known it; I have known boilers to leak when cold and take up when hot; whether it was due to the expansion or not, I don't know that I ever followed out any of those cases.

Q. How is it possible to stop a leak in a crown-sheet without taking it through the shop?

A. I have frequently stopped leaks in the stays in the flue-sheet by putting in saw dust or bran or any fibrous thing of that kind; saw dust and bran I always prefer, because that could be put in through the injector or fed through there (indicating), and I have known; in fact, frequently myself out on the road with a leaky fire box, I have gotten saw dust and put it in the tender and fed it through and stopped a leak so we could go on.

Q. How bad leaks have you seen stopped in that way?

[849] A. Several times when the engine was failing for steam we have been able to stop the leaks sufficiently to get up the steam and go ahead.

Q. What would be the proper size ring to put around this here (indicating) to give the same support that is furnished by four-inch stay-bolts? How far apart would you have to have your support there?

A. They ought to have been here and here and there and there (indicating), four inches apart, to get the exact conditions in that respect.

Q. If that had been four inches apart or any of this sheet had been four inches here (indicating), they would have bagged lots more, would they not?

A. Yes, sir.

Q. Would they or not bag more?

A. I am basing that that these were on a three-inch ring.

Q. That is what I understood Mr. Slayton to say these were.

A. Yes, sir.

Q. When iron is stretched like a sheet would necessarily

[850] be which failed with the pressure of the boiler on top of it,

what would be the effect of that stretching upon the small amount of soot or scale or something of that kind that might be on the boiler?

A. It breaks it off.

Q. Have you noticed that chalk line around that sheet?

A. Yes, sir.

Q. I wish you would say whether or not you think that is the line of demarcation between the water line and the sheet?

A. (Witness examines said sheet and chalk line.) I do not think that is relevant to the situation, because the stretching would have made the same line; that line is just at a point up here where the bending stopped. There is a little bending in there, there (indicating) is a point where the bending was great and slight here (indicating), there is a little scale there (indicating), and the results obtained there are practically the same for heating as for

[851] bending.

Q. You think bending would produce that?

A. Bending might have produced it and heating might have produced it; in the result it would be about the same.

Q. I want to know whether or not it is possible for that bolt to have been in that condition that his line on the diagram of Mr. Slayton indicates prior to the going down of the sheet.

A. If that had been hot enough it might have been forced into that shape.

Q. I mean the bolt. Would the bolt be forced into that shape?

A. Yes, sir; I think they could.

[852] Q. While the sheet was on, before it gave way; I mean that irregular shape?

A. Oh, I was going by that one on the diagram. If the sheet had been hot enough to force it in that shape it would have bent the bolt this way (indicating), just as much as on this side, because the pressure would have been the same here as there. In other words, if this snaky appearance had been so (indicating), it would also have been so (indicating) across that way.

Q. Just the same at right angles to it?

A. Yes, sir.

Q. This shape here could only have been formed by the coming down of the bolt and distorting it as it comes down?

Q. Explain to the jury then how that could have gotten in that shape?

A. If the sheet had been hot here and hot there (indicating) it would unquestionably be the same temperature on this side as on that

side, so that the bagging must have occurred all around; but if this side (indicating) had yielded, then it would have taken that form (indicating),; that is furthermore shown by the fact that this piece was broken off and pulled over that way (indicating). Now, when that finally gave way the bolt was up there and it was pulled out so (indicating). In other words, this must unquestionably have been the situation; the bolt must have been standing up this way when this was finally pulled off (indicating). (Witness is referring to bolt No. 10.)

Q. I want you to look at that and say whether or not you
[853] think that bolt was broken under the same conditions as the bolt head lying there on the table (counsel referring to the bolt head produced by the witness Mr. Kearner).

A. There are two essential differences, one is that this piece on the end here, that was twisted off, and it is larger than this piece (indicating) and apparently this has been nicked in very much deeper, therefore in screwing the bolts up this one had considerably greater strain on it.

A. This Kearney bolt had very much less strain on it. Further more, the bolt head No. 6 is broken off flush and way down in there, that projection shows it started to break while still up towards the water side of the sheet, where, from all I can gather from a study of this subject, hot bolts in a crown-sheet that has failed nearly always break just on the water side of the sheet, and that projection up there indicates that they started and broke in there.

Q. Near the water side?

[854] A. Far more near the water side than that (indicating).

Q. That is No. 6?

A. Yes, sir; than No. 6.

Q. I don't know whether the jury understood exactly what you said about the nick in this head. You can explain it to them with this bolt head here, and this bolt which has never been put into service and which has a head on it as originally constructed, just explain to the jury what you mean by nicking?

A. In order to get that off and at the same time not screw this up too tight, they cut in here (indicating) with a chisel, right around there and weaken it, and then the wrench is put on it, and that operation is what we call nicking.

Q. Were those bolts there which have been presented here as having been in this boiler nicked or do you see any evidence of their having been nicked?

A. I see no signs on that one (indicating No. 12); there is a

mark on this that may have been caused by a chisel but it looks more as if it had been caused by being hit with a hammer afterwards. I see no signs on No. 8, nor on No. 3. One corner of No. 1 seems to have been nicked a little bit, but I see no signs on the other corners. I see no signs of nicking on No.4 nor on No. 10 or No. 9, though there are chisel marks on them. No. 11 looks as if it might have been nicked on one corner. No. 7 apparently has not been
[855] nicked. No. 5 seems to have been nicked slightly on two corners. I see no signs of nicking on No. 2.

Q. Now, I hand you Mr. Kearney's bolt. Do you see any signs of nicking on that?

A. All four corners seem to be nicked slightly.

Q. Now, I hand you here a bolt with the figure "D. L. W. No. 9", has that been nicked?

A. Very heavily; that is the deepest cut of all.

Q. Mr. Bowden said, I believe, those bolts were put in and twisted until the shank or whatever you call it—what do you call that?

A. The wrench head.

Q. Until the wrench head part of it twisted off.

A. Those all look as if they had been twisted off.

Q. He said that was the customary way of putting it on. If they were nicked, would it or not put a slighter strain on the thread than if they were not nicked?

A. If it was nicked the stress would be less than if it was not nicked; that is, if it was nicked so that the diameter was one-half, the stress on the thread in breaking it would be one-eighth.

Q. Now, if the size of this wrench head which is on the bolt head, is larger than the strength of the thread; in other words, is so large that it will not give way before the threads are stripped, and that is screwed in that way, would it have a tendency to weaken the head of the bolt or injure it or not?

A. It would have a tendency to weaken the head of the
[856] bolt.

Q. And if the threads did not give way, if it is screwed in considerablly tighter than this bolt (indicating), would the crown-sheet becoming heated and the expansion produce any effect on the head, put in this way, the bolts were, without being nicked, and screwed in until the wrenched shoulder twisted off, then what effect would the subsequent heating and expansion have upon the bolt head, the wrenched shoulder not being nicked?

A. The question is rather ambiguous there, and looks as if

there are two questions in one. I think the point is probably this, as I explained in my direct examination: the effect of this tightening down is to put the strain right in here between the threads (indicating) and this head. Now, when that strain comes on, the iron inside there and all up in the head is under strain, if that head gets hot it will tend to crack it off right down in there, right around here (indicating), and as the head is probably hotter at the top here than further down, you would expect the line of least resistance or the weak point of the metal to go back up in the head.

Q. We interrogated you before on your direct examination with reference to screwing the bolts in the plate. Since then it has developed by the testimony of Mr. Bowden, that the method of putting these bolts in was by a wrench and twisting them in until that shoulder broke off. You told us by your examination of these bolt heads that they do not show any nicking. I will ask you first whether the nicking of a bolt on that shoulder weakens the shoulder and the nut?

[857]

A. The nicking of the head here makes it of less strength than it was before it was nicked, and it takes comparatively less effort to twist it off.

Q. Now, then, if it is screwed into the plate, nicked until the head twists off, does that put it in closer proximity or compress it into it tighter than it would if it was nicked?

[858]

A. Closer proximity, and what was the other word?

Q. Compress it into it tighter.

A. You mean this (indicating) and the sheet?

Q. Yes, sir.

A. Yes, sir.

Q. Would that have any effect on making an indentation in the plate?

A. It would tend to make a greater indentation in the plate.

Q. Now, please state to the jury if that plate and bolt became heated, whether or not the strain on the head of the nut next to the fire is intensified by the tight screwing of the bolt into the plate in that manner?

A. The tighter this head is screwed against the sheet the greater strain in there and the quicker the bolt will yield when heated.

Q. Mr. Kearney was on the stand and he told us that iron when heated would expand, but that if iron was thinner down in here (indicating) that the expansion of the iron would follow the line of least resistance. Is there anything in that? Is that possible?

A. Before I could answer that I would have to get a definition clearly. Iron will expand in all directions when heated, but if iron is constrained, say this was a piece of iron between my fingers, supposed to be immovable, then when that iron being strained and not being able to expand this way by heat will expand an additional amount that way (indicating) or this way, and if buckled down and not being able to move this way, the buckling will become greater.

[859]

Q. But so long as it could move in the direction of the bolt, would the buckling down have any effect on the expansion of iron on earth?

A. Yes; it would have this effect, that the resistance of the motion of the bolt from this way (indicating) would not have to be so great with a buckled down sheet as that straight one, or in other words, a straight sheet in between there, expanded, would give a greater pressure and have a greater tendency to force the sheet against the bolt than if it were buckled down.

Q. What I mean is this: I don't think you caught me, that if a bolt bends this way (indicating) and the expansion of the iron, until the iron reaches the bolt, could that possibly have any effect upon its expansion?

A. Unless there is some resistance there, it would have no effect.

Q. It would go up against the bolt as tight as it can before it would begin to buckle down?

A. Yes, sir.

Q. To make my question clear to the jury, if a nail is bent and you hit it and there is nothing to confine that nail any where, is the expansion effected by its being bent at all, if there is no confinement to the nail, I mean?

[860]

**A. It expands in all directions.**

Q. Now, if the ends of that nail are held between given points, then the expansion would come down in the bent shape?

A. The expansion would force the bend of the nail further down.

Q. Were you in here when the gentleman testified about this drum?

A. Yes, sir.

Q. Did you see the photographs taken of the bottom of this drum showing some leakage of water and the pressure and otherwise?

A. Yes, sir.

Q. Suppose just that amount of leakage had been in the boiler and the fire under the boiler was hot, what would be the effect upon that? Would it be noticeable?

A. The photographs were not particularly distinct, judging from the looks of them; I doubt very much whether it would have been—you mean in this particular case?

Q. Yes, sir.

A. The engineer had the brick arch in the front part,
[861] which makes it difficult to see back, and then there is another matter which comes up, that water at the boiler pressure was at about a temperature of 381 degrees, 380 degrees, Fahrenheit, and the moment it got out in the atmosphere enough of it would have gone into steam to reduce that temperature to about 212, or possibly a trifling above, but that 212 from 381 would have been, roughly speaking, 160 degrees. Now, 160 degrees, between 16 per cent and 17 per cent of it would have been immediately converted into steam, just from that action, and a large portion of the other would have been evaporated right there, evaporated into the fire box and carried into the flues, but I think some of that would have come down back of the brick arch.

Q. Some of the water, you mean?

A. Yes, sir; or on the brick arch, and I doubt very much whether a man could have seen it, but I think on a careful examination he could have seen it if he had been an experienced man, because as it came above the sheet around here (indicating) there would have been a boiling action there that you can generally see.

CROSS-EXAMINATION.

By Mr. Hall:

Q. You say that the stretching of the sheet would remove the soot and scale?

A. Yes, sir.

Q. Would the stretching or bending of the sheet change
[862] the color of the iron after it had been heated?

A. Would the stretching or bending of the sheet change the color of the iron?

Q. Yes, sir.

A. Not materially. I can answer that further if you want it, and explain it.

Q. That is all I want, but you can explain it if you want to. You say the snaky appearance of the crown-sheet to produce bolts in

that shape that they are in, would be in both ways or both directions length ways and across t?

A. I did not catch the first part of that sentence. Please read the question to me.

(Question is here read to the witness.)

A. Under the supposition of that sketch?

Q. Your testimony is, Professor Randolph, as I understand it, as you explained here a few minutes ago, that the buckling of that sheet would have been equal in both directions at right angles, length wise the sheet and across and would have forced the bolt in the same shape both ways, is that not a fact?

A. Under those conditions of that sketch.

Q. I am not asking you about the conditions of the sketch.

A. That is what I said, that is what I referred to.

Q. Didn't you say this a few minutes ago, that the buckling of that sheet would be equal in both directions, that is, it would buckle as much on one side of the bolt as it would on the other, and

[863] that the bolt would take the same shape on both sides?

A. That is this way (indicating), and that way (indicating).

Q. Yes, sir; at right angles.

A. Yes, sir; at right angles.

Q. Didn't you say that?

A. I did under the conditions of that sheet.

Q. What are the conditions of that sheet?

A. As I understood them, they were heated all around, uniformly heated all around.

Q. I am not imposing any conditions at all.

A. The question I answered did impose conditions.

Q. All right, I won't impose any conditions at all, and I want to ask you this question, whether or not the buckling of that sheet if it was overheated would be the same in both directions, that is, length ways of the sheet and across the sheet?

A. Uniformly overheated; yes, sir.

Q. It would be the same?

A. Yes, sir.

Q. Would the arched condition of the sheet as it is normally in the crown-sheet have anything to do with that buckling?

A. I do not think it would effect it.

Q. In other words, you think that a sheet that is arched one way and follows a perfectly straight line the other way, will buckle as much under the same pressure along the arched line as it

[864] will on the straight line?

A. It will if the haunches of the arch are not supported.

Q. Suppose they are supported by bolt heads.

A. Then it would be different, there would be a tendency to greater buckling the one way than the other.

Q. This sheet could not be buckled at all unless it was supported, would it?

A. We are getting a little mixed there.

Q. I am not getting mixed, but I asked you this simple question, whether the sheet could be buckled at all between the bolt heads unless it was supported by the bolts of the bolt heads?

A. No.

Q. It could not?

A. No, sir.

Q. So then, if it is supported by the bolts of the bolt-heads so it could be buckled, it would not be buckled as much on the arched line of the sheet as it would on the straight line, would it?

A. It depends whether the haunches of the arch would support it or not.

Q. Didn't you say it would have to be supported in order to be buckled at all?

A. No; you are twisting from one method of supporting to another method of supporting.

Q. What other method of supporting are you talking [865] about?

A. I am speaking of the haunches of the arch being supported, that is, when the arch sets that way (indicating), it has no strength at all, unless the stress that comes out this way on the end is supported (indicating).

Q. Would it be supported if the—

A. (Interposing.) I haven't finished my answer yet.

Q. All right, go ahead.

A. The other support you meant is a support by the bolts this way (indicating), you see the difference?

Q. Yes, I see the difference; but if you take between any two bolt heads running across that sheet, haven't you got an arch there between the two bolt heads?

A. But you cannot.

Q. I asked you the question if you have got an arch there?

A. Part of an arch.

Q. With the bolts in and the bolt heads on, isn't that an arch that you have got there and isn't it supported at both haunches, as you

say?

A. No.

Q. Why not?

A. Because the haunches are at the extreme end of the arch, where the arch faces.

Q. Where are the haunches? Isn't it this little arch that we have just described between the two bolt heads?

A. That is the end of the little arch; it is a part of an arch, and a part of an arch has no haunches.

Q. A part of an arch has no haunches?

A. No, sir.

Q. Now, Professor Randolph, you are a better mathema-
[866] tician than that; you know more about mathematics than that, I know. Now, suppose that arch has holes cut in it and I am taking a line now following the rows of these bolts, and in order that you may understand it on this sheet. Isn't a straight line drawn through the center of that row of holes across this crown-sheet and arch?

A. A whole straight line, yes.

Q. Now, I want to ask you whether or not a straight line between this bolt head and this bolt head isn't an arch?

A. It is a part of an arch.

Q. Part of an arch?

A. Yes.

Q. Isn't this a smaller arch, taking a straight line between this hole and this one?

A. How is that?

Q. Taking a straight line between the center of this hole and this hole, like that (indicating), isn't that an arch?

A. A straight line cannot be an arch.

Q. I am not asking you whether a straight line is an arch.

A. You said taking a straight line between those two bolts?

Q. I mean a straight line drawn following the circles
[867] here between the center of that hole and this, doesn't that form a small arch?

A. No, I would not say it is a small arch at all.

Q. What would you say it is?

A. I say it was part of a whole arch.

Q. Suppose you blot the whole crown-sheet out of existence, except this section in here that I marked off there with my pencil. Now, I want to blot all of this part here (indicating) out of existence except the space I have enclosed within that chalk mark there.

A. All right.

Q. Now I want to ask you whether or not a line following that arch between those two bolt heads isn't an arch?

A. It could be considered an arch.

Q. It is a small arch?

A. Part of an arch.

Q. And it could be considered an arch?

A. Yes, sir.

Q. All right we have got that far; now, I want to ask you another question

A. But do not let us lead off from that and come back, and what we say of that small one; attribute it to the whole arch.

Q. I don't want to do that; you need not bother yourself about that. Now, I want to ask you this question, if when this hole has a bolt in it, the hole is filled with a bolt with a head under it,
[868] and this hole has a bolt in it with a head under it (indicating), if the bolts on either side of that arch and the head of those bolts on either side of that arch, do not support it?

A. Support it as an arch?

Q. Yes, sir.

A. No, sir; they do not.

Q. Why not?

A. Because they do not give stress in the right direction; they support it as a beam, a curved beam.

Q. Taking the central point between those two bolt heads and applying pressure on that, which would have a tendency to buckle it? I want to ask you the question whether or not those bolts and bolt heads would not support that as an arch as against that pressure?

A. No, sir; just as a beam.

Q. So the fact that that space between those two bolt heads was buckled in the form of an arch, it wouldn't make it any stronger to resist the buckling effect than if it was straight across?

A. Supported by bolts; no, sir.

Q. It would not make it any stronger at all?

A. Supported by bolts, no.

Q. In order to make your theory good, it would be necessary for that arch to press out on the edges, wouldn't it?

A. Have something to resist it on the edges.

Q. Suppose it did not press on the edges at all, the
[869] haunches of the back arch remained perfectly intact. Now, I want you to tell the jury whether or not the arched condi-

tion would not prevent that sheet from buckling more cross-wise than it would lengthwise?

A. The word intact there.

Q. What do you call your haunches or big arch?

A. What do you mean by intact? You mean did not move?

Q. Yes.

A. If the haunches of that big arch did not move then it would be likely to act as an arch, then your little arch that you referred to, or part of an arch, as I call it, would also act as an arch.

Q. And the buckling would be less in that direction?

A. On account of that arch giving.

Q. Than it would in the other direction?

A. No, sir; to do that there must be this control of resistance at the haunches of the arch to keep it from spreading out.

Q. And if that crown-sheet on each side of it was not broken loose or disturbed along that outer line of bolts and the radial stay-bolts were still in position, then it was supported on the sides of that arch, wasn't it?

A. I don't know what the construction was on the side there.

Q. My question is if that part of the crown-sheet was not disturbed, including the outer row on each side of those bolts to here (indicating), the rest of the crown-sheet with your arch [870] would support it?

A. I cannot tell.

Q. If it was not disturbed, you cannot tell?

A. No, I cannot.

Q. In other words, you mean to tell this jury that if that outer line of bolts was held perfectly intact and the rest of the crown-sheet attached to it and held by radial stay-bolts was in perfect condition and held intact, that then that would not support it?

A. When you say that the haunches of the arch are held in position, then it would act as an arch.

Q. And under those conditions you would expect more bagging lengthwise than crosswise of that sheet?

A. Yes, sir.

Q. Did I understand you a few minutes ago to say that when this head was left on this bolt, that is, the square head, was burned off?

A. Likely to be.

Q. Just from the ordinary use of the engine?

A. The ordinary use of the engine.

Q. And the operating of the fire against the bolt?

A. Yes, sir.

Q. How is that burned off? How is it gotten rid of?

A. It gradually oxidizes or in some very hot fires they may melt and then it gradually oxidizes and works off.

Q. Just fluffs off, as we call it?

A. Yes, sir.

Q. Particles of iron drop off and fluff off?

[871] A. Pieces of iron crack in the cooling when the engine is shut down; when it is hot oxide will form when it is shut down and the oxide will crack off.

Q. How long does it take one of those heads to fluff off that way?

A. The head may disappear in a week and it may be two or three months.

Q. By that fluffing off process?

A. I do not think it would fluff off in a week.

Q. But you think it would in several months?

A. Yes, sir; I have seen cases of that kind where sometimes it will last for a year or two, and sometimes it will disappear in the course of three or four weeks or a month.

Q. If that fluffing off process takes place on the heads of the bolts, why do you expect to see where the nicking was in those heads?

A. That is on the head of the bolt, you refer when you speak of the head, I understand you to refer to the square head like this (indicating), and when I answered the question before, that is what I had reference to, not this round head.

Q. So you think there wouldn't be any fluffing off around the button-head bolt at all?

A. No, sir.

Q. You think not?

A. No, sir.

Q. Not even enough to do away with the chisel marks?

[872] A. No, I do not think so.

Q. You do not think so?

A. No, sir.

Q. Why don't you think so?

A. Because it is in here at the point of fracture; if that had been nicked you would have found the point of fracture and that would have been the weakest point. Now, here is one (indicating) that apparently has been nicked, and you see the fracture starts right down in the bottom of the head and one-half of it is on this and one-

half on the piece that went away (indicating). That is the purpose of the nick, to make it break at the point nicked, and you always leave one-half on one side and one-half on the other.

Q. I did not ask you that. You have said that the heat in the fire box of the engine was sufficient to make these square heads fluff off in the button-head bolts?

A. Yes, sir.

Q. Now, I have asked you a very simple question, whether or not that same heat in the fire box of the engine would make the top part of that square part or where it is joined to the button-head fluff off enough to remove the marks of the chisel?

A. I beg your pardon; it is not in this case.

Q. Would you expect it to do it?

A. Sometimes, yes, sir.

[873] Q. Now, isn't it a fact that the heat in the fire box is enough to fluff off the whole end of one of these square bolts, when you would expect it under ordinary conditions to fluff off the mark of the chisel at the point where it is nicked?

A. If it was great enough to fluff off the whole end down there, it might be great enough to destroy that nick mark, but if it was great enough to fluff off this portion up here, it would probably leave that.

Q. You did not say anything about fluffing off one portion and leaving the other; you said it would fluff off the whole end?

A. I do not think I used the word "whole".

Q. I do not think you did either, but I will ask you how long it would take to fluff off the square part of it?

A. I had in mind what is the actual or what is likely to take place, in following the technicalities of your question, but it would easily take a point about here (indicating); I think the heat passing through this bolt was sufficient to hold it at a low temperature.

Q. And you think under ordinary conditions that the heat would be sufficient to fluff off the marks of the chisel?

A. No; I do not think so.

Q. You do not think so?

A. No, sir.

Q. Now, Professor Randolph, you picked out a bolt, No. 6 there, I think it was, I wish you would find it again for me. (Witness does so.) And I understood you to say that the breaking of this bolt down into the head indicated that it was hot when it was broken, or when the head came off?

[874]

A. I do not think I said that.

Q. Didn't you tell Mr. Staples that a few minutes ago, when

you were recalled on the stand and you pointed out bolt head No. 6 and said that indicated that it was hot when it broke down into the head, it indicated that it was hot when it was broken off?

A. Not when it broke down in the head it indicated that, but that that looks as if it was hot when it was broken off.

Q. So you do not think that that break down into the head indicates that it was hot when it was broken off?

A. This part of the break does (indicating).

Q. Does the break down into the head of any of those bolts indicate that they were hot when they were broken?

A. It depends on the appearance of them.

Q. If this bolt, No. 6, was cold when it was broken off, tell the jury whether it would break down into the head or not, if it was under the crown-sheet with water on top of it.

A. I do not think it would.

Q. Why not?

A. I do not think it would go quite as far, it might go a little way, but the tendency would be to break more uniformly flat across there.

Q. When it was hot?

[875] A. When it was cold.

Q. I asked you when it was hot.

A. I understood you to say cold. It answers the question, I think.

Q. So when it was cold you think it would break more uniformly straight across the bolt?

A. Yes, sir.

Q. That is a little different from what you said the other day about those bolts, as to what they indicated being broken down in there, that they were broken when they were cold?

A. How is that?

Q. Didn't you say the other day when you were on the witness stand that the breaking of those bolts down under the head, that that indicated they were cold when they were broken?

A. I do not think I ever said that; some other things went on around there and that context was different from what it is now.

Q. I don't want to get any context about it. I want to understand what you mean; I want to understand whether the breaking of that bolt down into the head indicates whether the sheet had water on top of it or not, when it was broken in that way.

Plaintiff objected. Objection overruled.

[876] Q. What I want to know is whether or not the breaking down into the head of that bolt and the other heads of the bolts, if you choose, indicate whether the sheet had water on top of it when that break occurred, or not?

A. Read the question.

(Question is here read to the witness.)

A. There are two breaks apparently here, one across here down into the head over to about there (indicating), and that is the one that goes down into the head, that indicates that when they failed or subsequently that the head was hot, the other break over on this side, just a little portion here holding is not as dark in color, in fact it looks more like fresh air. This has been wet and that fresh air has gotten wet and has formed a red oxide, and that portion was broken, in my opinion, when the sheet had water on it.

Q. I will leave out of consideration entirely color, and I will limit my question simply to this, as to whether or not the concave break down into the head of that bolt indicates whether the sheet had water on it, whether it was hot or cold, that is, the sheet had water on it when it was broken?

A. Not necessarily.

Q. In other words, you think a cold bolt would break down in the head just as well as a hot bolt?

A. Not necessarily.

Q. What do you think?

A. It might or it might not.

[877] Q. You have changed your opinion from the time you testified in this case in Roanoke, from the fact that it would have something to do with it, to it might or it might not, haven't you?

A. No, sir.

Q. I am asking him about No. 6 that was among the nine that were shown him at Roanoke when he was testifying about the bolt heads. Now, I want to ask you, Professor Randolph, if you did not make this statement in regard to them: "These bolt heads indicate that they have been hot, and that they failed from being hot, [878] because they were broken, largely, where the heat is greatest, down in the head." Didn't you make that statement when you testified before?

A. I expect I did.

Q. Is your statement that you make here today that it might or it might not be hot consistent with that?

A. Exactly.

Q. How?

A. In this question you eliminated the color and in that ques-

tion you did not, and you did not bring either one of them in.

Q. Did you say anything about the color?

A. You said to eliminate the color.

By the Court:

You mean in Roanoke?

Witness:

No, sir; right here; he said to eliminate the color, and that changes the question entirely.

Q. Didn't you say in your testimony at Roanoke just as I have read to you that the breaking of those bolt heads down into the heads of the bolts showed that they were hot, and that they were very hot when they were broken?

A. Read the whole thing.

Q. Didn't you say that?

A. That may have been a part of my statement in regard to that.

Q. Now, I ask you if you qualified your statement in Roanoke at all by the color of the bolts, but didn't you say just as I have read to you from the record that the breaking down of the bolts

[879] into the head in that way indicated that it was hot when the break occurred?

A. Under the conditions of this bolt.

Q. Tell us what effect the color would have on it?

A. The color would have this effect, if it was hot we would have that blue color formed; if it was cold the metal would be bright, but the effect of that blue color, it is one of the oxides of iron, would be the rusty corrosion and the rusting by water, but in bright iron it would not rust it and you would have a bright iron turning to red, as you will find in this case.

Q. What bearing would the color have on the way the head of the bolt would break off, whether it would break down into the bolt or straight across?

A. What effect would the color have?

[880] Q. Yes, sir.

A. The color would show the conditions under which the bolt broke.

Q. What does the breaking down into the head of the bolt show?

A. That the metal was weaker down there than it was higher up.

Q. Does it show it was hotter down there than higher up?

A. It is one of the indications of it.

Q. So then, if I understand your testimony now, it is that the breaking of the bolt down into the head instead of breaking straight across is one indication that the bolt was hot when it broke?

A. Yes, sir.

Q. Then we understand each other that far, do we?

A. Yes, sir.

Q. You also say that the color that the fracture is indicates or is another indication that the bolt was hot when it broke?

A. Yes, the blue color. I would like to add a little to that. Had that been broken before and then subsequently heated, that blue color would have obtained.

Q. In other words, if it had been broken cold and subsequently heated, you would have the same blue color there?

A. Yes, sir.

[881] Q. But if it had been broken before and subsequently heated, that would not have changed the nature of the break down into the head of the bolt?

A. No, sir.

Q. So even if the bolt had been reheated and given a color, you still have one indication there that it was hot when it was broken by its breaking down into the head, haven't you?

A. Yes, sir.

Q. I wish you would look at that bolt and say whether or not that bolt was hot or cold when it was broken?

End of all evidence.

[882] And this being all of the evidence introduced by either party, the Court instructed the jury, as set forth in Bill of Exceptions No. 2, which is hereby referred to as a part hereof, and after hearing the arguments of counsel, the jury retired to their room to consider their verdict, and in a short time returned into court with the following verdict:

"We, the jury, find for the plaintiff against the defendant, and assess her damages at twenty thousand dollars ($20,000.00), and apportion the same as follows:

To Maude L. Andrews (widow).....$4,000.00
To Arthur A. Andrews (child).....$4,000.00
To Martha J. Andrews (child).....$4,000.00
To Peyton C. Andrews (child).....$4,000.00
To Macon Andrews (child).....$4,000.00

M. F. Harvey, Foreman."

And thereupon the defendant moved the Court to set aside the verdict and grant it a new trial upon the following grounds:

(1) The Court erred in admitting improper evidence before the jury over the objection of the defendant;

(2) The Court erred in refusing to admit before the jury proper evidence offered by the defendant;

(3) The Court erred in refusing to give to the jury proper instructions offered by the defendant;

(4) The Court erred in giving improper instructions to the jury over the objections of the defendant;

(5) The verdict is contrary to the law and the evidence;

(6) The verdict is excessive.

[883] Which motion the Court overruled, and entered a judgment on said verdict in favor of the plaintiff, to which ruling of the Court in overruling said motion, the defendant, by counsel, excepted, and tenders this its Bill of Exceptions No. 1, which is signed, sealed and made a part of the record, this 18th day of November, 1914.

W. W. MOFFETT, Judge. (Seal)

Maude L. Andrews, Admx. of A. W. Andrews, dec'd.,

v.

The Virginian Rwy. Co.

[884] BILL OF EXCEPTIONS No. 2.

Be it remembered that upon the trial of this case, after the plaintiff and defendant had introduced on their parts respectively the evidence set forth at large in Bill of Exceptions No. 1, which is hereby referred to as a part hereof, the plaintiff moved the Court to instruct the jury as follows:

## INSTRUCTIONS.

1.

[885] The court instructs the jury that it was the duty of the defendant company on November 14th, 1912, to have the locomotive engine No. 469 equipped with a boiler and appurtenances thereof, which were in proper condition, and safe to operate in the service to which the same was being put, that the same may be employed in the active service of such carrier in moving traffic without unnecessary peril to life or limb, and if the jury believe from the evidence that at the time said locomotive was delivered to the deced-

ent, A. W. Andrews, at Roanoke, the crown bolts or stay-bolts of the boiler of said locomotive had become burned in service, and weak and unsafe, or had become broken, and therefore weak and unsafe and unable to withstand the ordinary pressure and strain imposed upon them by the steam which would properly be generated in said boiler in the customary service of the said engine, or that said crown-bolts or stay-bolts were improperly screwed in, and improperly adjusted in construction, or were constructed of defective and faulty material, and that as a sole, direct and proximate result of said condition of said stay-bolts or crown-bolts, the crown-sheet of said locomotive No. 469 failed and gave way at a time when there was a sufficient quantity of water over the crown-sheet to prevent burning and injuring the crown-bolts and stay-bolts at the time of said failure, and permitted the water to escape into the cab of said engine and injure the plaintiff's intestate, A. W. Andrews, while in the performance of his duties as engineer on said locomotive, so that he died therefrom, then the jury shall find for the plaintiff.

No. 2.

[886] The court instructs the jury that it was the duty of the defendant company on November 14th, 1912, to have the locomotive engine No. 469 equipped with a boiler and appurtenances thereof which were in proper condition and safe to operate in the service to which the same was being put, that the same may be employed in the active service of such carrier in moving traffic without unnecessary peril to life or limb, and if the jury believe from the evidence that the glass water guage was an appurtenance of the boiler of said locomotive and at the time the engine was delivered to the engineer, A. W. Andrews, on said day, said water guage was out of repair and in an unsafe condition due to the valves or holes at the bottom or top thereof being stopped up by lime or other deposits, causing said glass water guage to incorrectly register or indicate a much larger quantity of water in the boiler than said boiler really contained, and the engineer and fireman relied on said glass water guage, and that as a direct and proximate result of said incorrect registration and defective condition of said water glass the water in the boiler became so low that without the knowledge of the engineer and fireman [887] the stay-bolts or crown-bolts of said locomotive No. 469 became overheated and weakened because of a scarcity or absence of water over the crown-sheet, and gave way and caused the crown-sheet to collapse, and hot water and steam to escape and injure the plaintiff's intestate, A. W. Andrews, while in the performance of

A. Yes, sir.

his duties as engineer on said locomotive, so that he died therefrom, then the jury shall find for the plaintiff.

No. 3.

The court instructs the jury that if they believe the plaintiff entitled to recover in this case under the evidence and other instructions of the court, they shall assess a gross sum as damages which the plaintiff shall recover, and shall apportion this gross sum between the widow and children of decedent according as the evidence shows her or their individual pecuniary loss.

In estimating the amount of damages which you shall apportion or award to decedent's widow, you can consider only the pecuniary loss which she is shown to have sustained, that is, the deprivation of the pecuniary benefits which she might have reasonably received if the deceased had not died from his injuries; you cannot consider grief or wounded feelings or loss of society of her husband, but you may consider the value of such loss of support and maintenance as the evidence shows, including loss of service which she might under the evidence have reasonably received and which can only be supplied by the service of another for compensation.

In estimating the amount of damages which you shall award or apportion to decedent's children you can only consider the pecuniary loss which they are shown to have sustained, or the deprivation of the pecuniary benefits which they might have reasonably received if the deceased had not died of his injuries. You cannot consider
[888] their grief or wounded feelings or the loss of society of their father, but the damages may include such loss of support and maintenance as the evidence shows, including the loss of that care, counsel, training and education which they might, under the evidence, have reasonably received from their father, and which can only be supplied by the service of another for compensation.

The jury should also consider the decedent's age, his habits of industry, earning capacity, and the extent to which he customarily provided for his wife and children during his lifetime.

The jury are further instructed that the amount of damages which they may award the plaintiff, shall not exceed fifty thousand dollars, the amount asked for in the declaration.

No. 3½.

The court instructs the jury that the plaintiff has withdrawn the

fourth count in the declaration, and there can be no recovery, based on the fourth count.

No. 4.

[889] The court instructs the jury that if they believe from the evidence that the failure of the crown-sheet of the engine which resulted in the death of plaintiff's intestate resulted proximately from one or more causes alleged in the first and third counts of the declaration, for all of which the defendant is responsible, then they should find for the plaintiff and assess her damages at such sum as shown by the evidence she is entitled to receive, not in excess of the sum of fifty thousand dollars.

To the giving of which instructions the defendant, by counsel, objected, but the Court overruled the defendant's objections and gave said instructions as offered by the plaintiff, and thereupon the defendant moved the Court to instruct the jury as follows:

[890] DEFENDANT'S INSTRUCTIONS.

No. 1.

The jury are instructed that the mere fact that the plaintiff's intestate was killed by the failure of the crown-sheet of one of defendant's engines, on which he was employed as engineer, does not raise any presumption against the defendant that the boiler and appliances were not in good condition and not safe to operate, and the burden rests on the plaintiff to establish by a preponderance of affirmative evidence, sufficient to satisfy reasonable and well-balanced minds, some fact, or facts, by which it can be determined how and why the crown-sheet failed, and that it failed from a cause for which the defendant is responsible. It is not sufficient to show that the defendant's boiler and appliances may have been defective or in an unsafe condition, or that the accident may have resulted from one of several causes, for one or more of which the defendant is not responsible.

No. A.

[891] If the jury believe from the evidence that the crown-sheet was burned and rendered unsafe after the inspection of November 11, 1912, and that plaintiff's intestate was solely responsible for said crown-sheet being burned, whether it occurred at time of failure or prior thereto after such inspection, then the plaintiff cannot

recover in this case.

The jury are further instructed that if they believe from the evidence that it is just as probable that the crown-sheet was burned by plaintiff's intestate as that it was burned by some one else, they must find for the defendant.

No. 3.

The Court instructs the jury that if they believe from the evidence in this case that the water glass guage was in good or safe condition, they *just* find for the defendant on the third count of the plaintiff's declaration.

No. 4.

[892] The Court instructs the jury that there is no evidence in this case that the injector on the engineers' side of engine No. 469 was out of repair, and failed to properly pump water into the boiler, and that they cannot find for the plaintiff on the second count of the plaintiff's declaration.

No. *B.*

The Court instructs the jury that in order for the plaintiff to recover under the first count of the declaration, the plaintiff must show by a preponderance of the evidence that the crown-sheet or stay-bolts of the engine was weak and unsafe on account of having been burned or overheated in service by some one other than the plaintiff's intestate.

No. *D.*

The jury are instructed that if they believe from the evidence in this case that the crown-sheet which failed and resulted in the death of the plaintiff's intestate, was not burned or overheated prior to the inspection of November 11, 1912, and that thereafter, until the time of the accident, it was the duty of the plaintiff's intestate to inspect and report defects in said engine, and that such duty was not [893] imposed upon any other person, and that the burned or overheated condition of said crown-sheet, if burned prior to the time of failure, could have been detected by a proper inspection of the same by the plaintiff's intestate, then the plaintiff cannot recover in this case.

To the giving of which instructions the plaintiff, by counsel, ob-

jected, and the Court gave instructions Nos. 1, 3 and 4, as asked for by defendant's counsel, and refused to give instructions Nos. *A*, *B* and *D*, as asked for by defendant's counsel; thereupon defendant's counsel amended instruction *A*, to which plaintiff objected, and said instruction as amended was given as follows:

No. 2.

If the jury believe from the evidence that the crown-sheet was burned and rendered unsafe after the plaintiff's intestate took charge of the engine the evening of November 14, 1912, and that plaintiff's intestate was solely responsible for said crown-sheet being burned, whether it occurred at the time of failure or prior thereto, after such delivery, then the plaintiff cannot recover in this case.

The jury are further instructed that if they believe from the evidence that it is just as probable that the crown-sheet was burned solely through the fault of the plaintiff's intestate as it is that it was burned by some one else, they must find for the defendant.

[894] And the defendant amended Instruction No. *B* and offered it as No. *C*, which is as follows:

No. *C*.

The Court instructs the jury that in order for the plaintiff to recover under the first count of the declaration, the plaintiff must show by a preponderance of the evidence that the crown-sheet or stay-bolts of the engine was weak and unsafe on account of having been burned or overheated in service by some one other than the plaintiff's intestate, or on account of defects in the stay-bolts due to the manner of screwing the same into the crown-sheet in the construction of the boiler.

And the plaintiff objected thereto, and the Court refused to give said instruction as amended, to which ruling of the Court in giving said instructions offered by the plaintiff, and in refusing to give defendant's instructions *A*, *B*, *C* and *D*, the defendant, by counsel, excepted, and tenders this its Bill of Exceptions, which is signed, sealed and made a part of the record this 18th day of November, 1914.

W. W. Moffett, Judge. (Seal)

Maude L. Andrews, Administratrix of A. W. Andrews, deceased,

v.

The Virginian Railway Company.

[895] BILL OF EXCEPTIONS No. 3.

Be it remembered that upon the trial of this case the plaintiff, to maintain the issue on her part, introduced the witness Jerry Walton, whose testimony is set forth at large in Bill of Exceptions No. 1, which is hereby referred to as a part hereof, and after the witness had testified as follows:

"Q. Tell the jury whether or not that crown-sheet was heated to a red hot heat at the time of this accident."

"A. No, sir; I cannot say.

"Q. Mr. Walton, if a crown-sheet is heated to a red heat, will it make any different light in the fire box than when not heated—the difference between a blue and red appearance, I mean?

"A. I never did see one heated."

the court, over the objection of the defendant, permitted plaintiff's counsel to ask the witness to answer the following questions:

"Q. I will ask you this question: Was the crown-sheet of that boiler so much within the range of your vision in firing this boiler that if it had been heated to a red heat that you would have been bound to have noticed it? Do you understand the question?

"A. I couldn't say positively on that.

"Q. Give us your best judgment on that. What do you say to that?

"A. I suppose you would.

"Q. Now, then, to clarify the record upon this point, do I understand you to say that if the crown-sheet had been heated to a red heat, it was so within your range of vision while firing the engine that you think you would have been bound to have seen it?

"A. Yes, sir.

To which ruling of the Court in permitting the witness to answer said questions, the defendant, by counsel, excepted, and tenders this its Bill of Exceptions No. 3, which is signed, sealed and made a part of the record, this 18th day of November, 1914.

W. W. Moffett, Judge. (Seal)

Maude L. Andrews, Administratrix of A. W. Andrews, deceased,

v.

The Virginian Railway Company.

[897] BILL OF EXCEPTIONS No. 4.

Be it remembered that upon the trial of this case, the plaintiff, to maintain the issue on her part, introduced the witness F. A. Richardson, whose testimony is set forth at large in Bill of Exceptions No. 1, which is hereby referred to and made a part hereof, and over the objection of the defendant's counsel, the Court permitted the witness to testify as follows:

"Q. If the crown-sheet was red hot, will you tell the jury whether there would be a difference in the glow in that fire box?

"A. It undoubtedly would. I never seen one red hot, but in my judgment there would be; undoubtedly there would be, if the crown-sheet was hot, in addition to the fire you have in there, you have also an arch, and there would be an additional light there and heat to make it light."

To which questions and answers the defendant moved the Court to exclude, but the Court overruled the defendant's motion to exclude the same, to which ruling of the Court the defendant, by [898] counsel, excepted, and tenders this its Bill of Exceptions No. 4, which is signed, sealed and made a part of the record, this 18th day of November, 1914.

W. W. Moffett, Judge. (Seal)

Maude L. Andrews, Admx. of A. W. Andrews, dec'd.,

v.

The Virginian Railway Company.

[899] BILL OF EXCEPTIONS No. 5.

Be it remembered that upon the trial of this case, the plaintiff, to maintain the issue on her part, introduced the witness Arthur Scrivenor, whose testimony is set forth at large in Bill of Exceptions No. 1, which is hereby referred to as a part hereof, and who testified as follows, with reference to his qualification as an expert:

"Direct Examination.

By Mr. Staples:

Q. What is your business?

A. An engineer.

Q. Tell the jury what experience you have had, what line of work you have been engaged in that brings you in touch with locomotive boilers and kindred questions?

A. When I first left school I went to the Barrow Hematite Steam & Iron Works in Lancashire, England, where I was employed in firing boilers, and gas producers. From there I went to North Greenwich, where they had an experimental station, firing boilers with coal and with oil, they had about seven or eight boilers there, and from there I went to the Unity Iron Works, and from there I came to this country and I was employed at the American Locomotive Works,
[900] then the Richmond Locomotive Works, in the drawing offices, and in 1893 I went into business for myself doing engineering work, and for several years I have been occupied in what is called power plant work, familiar with the stationary boilers particularly, and had a good deal to do with boilers and engines, electrical apparatus and things of that kind. In that time I had charge of manufacturing plants, foundry work and machine shops and so forth.

Q. Have you examined the crown-sheet over there in this case?

A. Yes, sir.

By Mr. Hall:

I do not think the witness has qualified as an expert on locomotive boilers and I would like to ask him a few questions along that line.

By the Court:

Very well.

By Mr. Hall:

Q. What experience have you had with locomotive boilers, Mr. Scrivenor?

A. You mean in running locomotive boilers?

Q. No, I mean in knowing anything about them.

A. Only while I was in the locomotive works and what I have seen with my eyes at other times since, and what I have read about them.

Q. You were a draftsman in the office of the locomotive
[901] works?

A. Yes, sir.

Q. You had nothing to do with the construction of boilers?

A. Except to go to the shops and see how things were carried out and that they were carried out.

Q. To see that they were constructed according to the plans you drew?

A. Yes, sir: I mean going in and getting the details, and I was brought in touch with the work going on in the shop. I do not mean to say we were put in the place of the foreman, because we were not.

Q. You had nothing to do with the construction of boilers, actual boiler work?

A. No, sir.

Q. You had nothing to do with the running of locomotive engines or repairing locomotive engines?

A. No, sir.

Q. And your experience in connection with locomotive engines ended in 1893?

A. Any practical experience that I had with them; yes, sir.

Q. How long were you in the drafting room in the Richmond Locomotive Works?

A. From December, 1891, until they closed in 1893; I
[902] have forgotten the month.

By Mr. Hall:

That is all I desire to ask the witness, but we think the witness is clearly incompetent to testify as to locomotive boilers.

By Mr. Staples:

We think he is qualified to speak as to that.

By Mr. Staples:

Q. I will ask you whether or not, in your work in the locomotive works at Richmond, you were necessarily brought in contact with the actual manufacture and building of boilers?

A. Yes, sir; I saw them built every day I was there.

By Mr. Hall:

Q. What kind of locomotives were being built in 1893?

A. You mean what types?

Q. Yes.

A. They were older types than are built today.

Q. They were entirely different types of engine?

A. Very much different. The first radial stay fire box, I think, was built at the Richmond Locomotive Works while I was there, and it was designed by the master mechanic of the C. & O. railroad.

Q. And the types of locomotive engine in their size and kind of crown-sheets and stay-bolts have entirely changed since 1893?

A. I do not think the kind of crown-sheet and the kind of stay-bolts have changed very much since the radial stays and radial crown-sheets were started, but I think the type of
[903] locomotive has changed a great deal.

By Mr. Staples:

Q. Mr. Scrivenor, did the work that you have done require knowledge of the principles which would be applicable in determining from an inspection of a crown-sheet of an exploded locomotive, a failed crown-sheet, as to the cause of the failure?

Defendant objected.

By the Court:

Ask him what experience he has had to enable him to determine that.

Defendant excepted.

A. Ask that question again, please.

(The question is read to the witness.)

A. You use the word "require", I cannot say my work has required that knowledge, but one acquires that knowledge by pursuing that work.

Q. Do you think you are familiar with those principles of mechanical physics which would be involved in determining that?

A. I think so.

By the Court:

Go ahead.

[904] Q. Mr. Scrivenor, have you examined the crown-sheet in this case, lying over there in view of the jury?

A. Yes, sir.

By the Court:

I suppose it is admitted that is the crown-sheet?

By Mr. Hall:

Yes, sir; that is the crown-sheet.

By Mr. Staples:

The defendant produced this crown-sheet as the crown-sheet that was blown down when the explosion occurred and when Mr. Andrews was killed.

By Mr. Hall:

We object, if your Honor please, to the witness answering any question with reference to this crown-sheet as an expert witness, on the ground that he has not shown himself qualified to answer as an expert witness.

By the Court:

That isto save making any exceptions hereafter?

By Mr. Hall:

Yes, sir.

By the Court:

Just note the objection, and objection overruled.

By Mr. Hall:

I want to ask one question. Have you ever examined a crown-sheet of a locomotive that failed from low water?

Witness:

No, sir.

By Mr. Hall:

Did you ever see one in your life before you saw this crown-sheet that had failed and was buckled down as this crown-sheet is?

Witness:

I didn't catch that, please read it.

[905] (Question read to witness.)

A. Not unless I saw it on a scrap heap. I mean I may have seen one but I cannot say definitely at any particular place that I did see one.

Q. You cannot say definitely that you ever saw a crown-sheet in your life that was blown out on account of low water?

A. I cannot say it was blown out on account of low water.

Q. Can you say that you ever saw a crown-sheet blown out in any way in an explosion of an engine?

A. I did not see the explosion, but I have seen damaged engines and damaged fire boxes.

Q. I asked you about locomotive engines?

A. I am speaking of locomotives.

Q. You do not know whether any of them were damaged by an explosion caused by low water or not?

A. No, sir.

By Mr. Hunt:

Mr. Hall has assumed as a matter of fact this one has, and I submit that it is not proper.

By the Court:

Go ahead.

By Mr. Hall:

We want to renew our objection to the witness being allowed to testify as an expert as to this crown-sheet.

By the Court:

Unless you have some other objection, this one exception can be to all of this evidence along this line.

Defendant excepted.

[906] By Mr. Staples:

Q. Has your experience made you familiar—that is, your experience and study, made you familiar—with the effect upon iron of heat; that is, the effect upon its holding power, and the effect upon its appearance?

A. I have had considerable experience from its appearance.

Q. Have you made a considerable study of the effect of heat upon its holding power?

A. To some extent."

And the defendant, thereupon, by counsel, objected to the said witness being allowed to testify as an expert witness, but the Court overruled said objection, and allowed the witness to testify, which evidence is fully set forth in Bill of Exceptions No. 1, to which reference is hereby specifically made; to which rulings of the Court in

permitting the said witness to testify as an expert witness as set forth in Bill of Exceptions No. 1, the defendant, by counsel, excepted and tenders this its Bill of Exceptions No. 5, which is signed, sealed and made a part of the record this 18th day of November, 1914.

W. W. MOFFETT, Judge. (Seal)

Maude L. Andrews, Admx. of A. W. Andrews, dec'd.,

v.

The Virginian Railway Company.

[907] BILL OF EXCEPTIONS No. 6.

Be it remembered that upon the trial of this case, the plaintiff, to maintain the issue on her part, introduced the witness Arthur Scrivenor, whose testimony is set forth at large in Bill of Exceptions No. 1, which is hereby referred to as a part hereof, and after counsel for defendant had objected to the testimony of this witness as an expert witness, and after the witness had testified as follows:

"Q. How hot could the sheet have been and retain its present appearance?

A. I couldn't say definitely, as I have no records of my own covering that point.

Q. From your study of the subject?

A. I will state that I have read in Treaties on Heat and such things, that I should say a Fahrenheit heat from 1000 to 1200 degrees.

Q. If that crown-sheet is supported by one and one-eighth inch button-head bolts, what would you think would have been the holding power of those bolts if they had been in perfect condition at dull red heat, per pound pressure, that they could have withstood?

[908] To which question the defendant objected, and thereupon, after counsel for the plaintiff was informed as to the character of the material of which the stay-bolts was made, he amended said question by adding thereto, "I will predicate my question then upon that bolt being made of fibrous wrought iron or special stay-bolt iron—I am talking about first-class material." And the witness was permitted, over the objection of defendant's counsel, to answer said question as follows:

"A. I have not made any definite tests as to the holding power of a red hot bolt myself, but according to Kent, who is considered an authority, I see it on the table here, I have it

myself, the best Lancashire iron which is considered first-class fibrous iron on the other side, it is supposed to increase its strength up to a temperature up to 500 or 600 degrees and then lose its strength down to a limit, I think Kent says something like seven or eight thousand pounds, that is, per square inch. I know that is bright red heat, dull red heat, it would be safe to say it would stand seven thousand pounds."

[909] To which ruling of the Court in permitting the question and allowing the witness to answer same, the defendant, by counsel, excepted, and tenders this its Bill of Exceptions No. 6, which is signed, sealed and made a part of the record this 18th day of November, 1914.

W. W. MOFFETT, Judge. (Seal)

Maude L. Andrews, Admx. of A. W. Andrews, dec'd.,
v.
The Virginian Railway Company.

[910] BILL OF EXCEPTIONS No. 7.

Be it remembered that upon the trial of this case, the plaintiff, to maintain the issue on her part, introduced the witness Arthur Scrivenor, whose testimony is set forth at large in Bill of Exceptions No. 1, which is hereby referred to as a part hereof, the Court permitted the witness, over the objection of the defendant's counsel, to testify as follows:

"Q. I wish you would state what effect is sometimes produced upon the bolts of a crown-sheet by the fireman opening the box or opening the door and allowing cold drafts to go in?

A. The expansion of the fire box is due to heat, and if cold air is allowed to strike upon the crown-sheet of any kind of boiler, it must contract it, if it changes its temperature at all; that subjects the bolt to unequal strain and sudden strain sometimes, and it weakens the bolt in some cases and in some cases it breaks them. In case cold air strikes it, it causes a usdden contraction, an unequal contraction of the sheet, which has been previously heated."

[911] To which ruling of the Court in permitting the witness to so testify in answer to said question, the defendant, by sudden contraction, an unequal contraction of the sheet, which

is signed, sealed and made a part of the record, this 18th day of November, 1914.

W. W. MOFFETT, Judge. (Seal)

Maude L. Andrews, Admx. of A. W. Andrews, dec'd.,

v.

The Virginian Railway Company.

[912] BILL OF EXCEPTIONS No. 8.

Be it remembered that upon the trial of this case the plaintiff, to maintain the issue on her part, introduced the witness L. S. Randolph, whose testimony is set forth at large in Bill of Exceptions No. 1, hereby referred to as a part hereof, who was permitted to testify over the objection of the defendant, as follows:

"Suppose some sort of metallic substance, or pieces of iron or bolts had been left in there by the manufacturers, and had laid on top of that sheet, would that have had the effect of making it bag, probably?

A. I cannot imagine how anything of that kind would have effected it.

Q. You do not think that would have affected it?

A. I cannot imagine how it would have affected it.

Q. But you think mud or oil might cause it, without the absence of water from the sheet?

A. It might cause it."

To which ruling of the Court in permitting the witness to so testify, the defendant, by counsel, excepted, and tenders this its Bill of Exceptions No. 8, which is signed, sealed and made a part

[913] of the record this 18th day of November, 1914.

W. W. MOFFETT, Judge. (Seal)

Maude L. Andrews, Admx. of A. W. Andrews, dec'd.,

v.

The Virginian Railway Company.

[914] BILL OF EXCEPTIONS No. 9.

Be it remembered that upon the trial of this cause, the plaintiff, to maintain the issue on her part, introduced the witness L. S. Randolph, whose testimony is set forth at large in Bill of Exceptions

No. 1, which is hereby referred to as a part hereof, who was permitted to testify, over the objection of the defendant's counsel, as follows:

> "Q. If the water glass was in good, perfect condition at the time it was turned over to the engineer at Roanoke, could it have been possible for scale to have been deposited on it in such a way as to cause it to register erroneously an hour or so later?
>
> A. You will have to define what you mean by scale, the question as stated there seems to indicate that you mean lime salts, which are deposited from the water. I do not see how it would be possible for those lime salts to close up that guage in an hour or so, if it had been in anywhere near its proper condition when it left Roanoke."

[915] To which ruling of the Court in permitting the witness to so testify, the defendant, by counsel, excepted, and tenders this its Bill of Exceptions No. 9, which is signed, sealed and made a part of the record, this 18th day of November, 1914.

W. W. MOFFETT, Judge. (Seal)

Maude L. Andrews, Admx. of A. W. Andrews, dec'd.,

v.

The Virginian Railway Company.

[916] BILL OF EXCEPTIONS No. 10.

Be it remembered that upon the trial of this cause, the plaintiff, to maintain the issue on her part, introduced the witness, L. S. Randolph, whose testimony is set forth at large in Bill of Exceptions No. 1, which is hereby referred to as a part hereof, and the witness, after testifying that the bolts, which are fastened into the crown-sheet, go up into the wagon top sheet, as it is sometimes called, was permitted to testify over the objection of the defendant's counsel, as follows:

> "Q. I want you to eliminate from your answer the detailing of any experiments which you have made; just give conclusions which you have, applicable to this crown-sheet, and if you think you are qualified to state to the jury what effect of the change of the angle between those sheets upon this crown-sheet in question, the effect upon those bolt heads of the change in the angle between the sheets in this boiler, then you can answer it, otherwise you cannot,

A. I think it would have a slight effect on those bolt heads.

Q. State whether or not the change of the relative positions of those two sheets would probably weaken the bolts or bolt heads along the top of the whole crown-sheet?

A. It would tend to weaken it. I do not think the motion at the head in the crown-sheet on account of the length of the stays would be sufficient to injure the bolts very seriously unless the engine was running a long time."

[917] To which ruling of the Court in permitting the witness to testify as hereinabove shown, the defendant, by counsel, objected, and tenders this its Bill of Exceptions No. 10, which is signed, sealed and made a part of the record, this 18th day of November, 1914.

W. W. MOFFETT, Judge. (Seal)

Maude L. Andrews, Admx. of A. W. Andrews, dec'd.,

v.

The Virginian Railway Company.

[918] BILL OF EXCEPTIONS No. 11.

Be it remembered that upon the trial of this case, the plaintiff, to maintain the issue on her part, introduced the witness, L. S. Randolph, whose testimony is set forth at large in Bill of Exceptions No. 1, which is hereby referred to as a part hereof, and counsel for plaintiff asked the witness the following question:

"Q. Now, as to the button-head bolts, is there a liability to injury when they are screwed into the fire box where the holes are not tapped at right angles to the sheet, and where the surface of the sheet is curved?"

To the asking of which question, the defendant, by counsel, objected, but the Court overruled the defendant's objection, and allowed the witness to answer as follows:

"A. If your Honor please, I want to change that question a little bit. The tapping—there are two holes to be considered in order to make it clear to the jury, the tapping of one hole at right angles to the sheet, whether that hole is tapped at right angles to the sheet does not matter so very much, but tapping or having both holes punched so that when the stay is put in the heads will come out and bear evenly all around the sheet. Now, if it is not put in so, one side of the

head may bear hard and the other side not at all, and then when you screw it up tightly it will tend to crack the head off."

And the witness was then asked the following question:

"Q. Is it, or not, in your opinion, necessary practice in building locomotives to use a seating tool which faces off the inside of the sheet exactly at right angles to the longitudinal axis of the bolts?"

[919] To which question the defendant, by counsel, objected, but the Court overruled said objection and allowed the said question to be answered as follows:

"A. I think it is advisable, though if care is taken in seating those holes, I do not think it is necessary, or if a washer is used under the head it would not be necessary."

To which action of the Court in overruling the defendant's objections to the foregoing questions (and answers) the defendant, by counsel, excepted, and tenders this its Bill of Exceptions No. 11, which is signed, sealed and made a part of the record, this 18th day of November, 1914.

W. W. MOFFETT, Judge. (Seal)

Maude L. Andrews, Admx. of A. W. Andrews, dec'd.,

v.

The Virginian Railway Company.

[920] BILL OF EXCEPTIONS No. 12.

Be it remembered that upon the trial of this case, the plaintiff, to maintain the issue on her part, introduced the witness L. S. Randolph, whose testimony is set forth at large in Bill of Exceptions No. 1, which is hereby referred to as a part hereof, and plaintiff's counsel asked the witness the following question:

"Q. Is it or not true that the sudden letting down of a few bolts throws such additional load on the adjacent ones that they are frequently unable to stand the strain and tear out row by row until the whole crown-sheet is blown down?"

And the defendant, by counsel objected to the substance but not to the form of said question, and the witness answered as follows:

"A. Changing that one word "frequently", and making it "may", I would say yes."

And thereupon, the defendant, by counsel, objected to the answer in

its amended form, but the Court overruled said objection and
[921] refused to exclude said answer; to which ruling of the Court the defendant, by counsel, excepted, and tenders this its Bill of Exceptions No. 12, which is signed, sealed and made a part of the record, this 18th day of November, 1914.

W. W. MOFFETT, Judge. (Seal)

Maude L. Andrews, Admx. of A. W. Andrews, dec'd.,

v.

The Virginian Railway Company.

[922] BILL OF EXCEPTIONS No. 13.

Be it remembered that upon the trial of this case, the plaintiff to maintain the issue on her part, introduced the witness G. W. Mitchell, and offered to prove by him the expectancy of the plaintiff's intestate by showing what the expectancy was according to the standard table of mortality issued by insurance companies, and after the witness had testified that these tables are made up of the expectancy of the average man in good health, and that on account of the employment of railroad engineers being more hazardous than that of an ordinary man, that insurance companies have different rules with reference to the insurance of railroad engineers and will not issue to them the ordinary life policy, the defendant, by counsel, objected to the introduction of these tables of mortality on the ground that it has been shown by the evidence in this case that Mr. Andrews was not a man of average good health and followed a dangerous occupation, more hazardous than the ordinary occupation; but the Court overruled said objection and permitted the witness to testify that the expectancy of the plaintiff's intestate at 38 years of age would be 29.62 of a year;
to which ruling of the Court in allowing the witness to so
[923] testify, the defendant, by counsel, excepted, and tenders this its Bill of Exceptions No. 13, which is signed, sealed and made a part of the record, this 18th day of November, 1914.

W. W. MOFFETT, Judge. (Seal)

Maude L. Andrews, Admx. of A. W. Andrews, dec'd.,

v.

The Virginian Railway Company.

[924] BILL OF EXCEPTIONS No. 14.

Be it remembered that upon the trial of this case, the defendant,

to maintain the issue on its part, introduced the witness A. H. McGhee, whose testimony is set forth at large in Bill of Exceptions No. 1, which is hereby referred to as a part hereof, and after the witness had testified that he had made an inspection of engine No. 469 as required by the Boiler Inspection Law, and had made a sworn report to the U. S. Government as required by said act, the plaintiff's counsel was permitted, over the objection of the defendant, to cross-examine the witness as follows:

"Q. I will change the form of the question. Did you make a report on engine No. 473 just before its crown-sheet had trouble?

A. When 473 came in there, the night man, he got the engine and then it went to the back shop, and I inspected it there, but I do not know the date.

Q. You still haven't answered my question. I asked
[925] you if you made a report of engine 473 just before, not after this trouble, but before it had trouble with its crown-sheet, the same kind of report that you sent in on 469?

A. Yes, sir.

Q. You reported that in good fix, didn't you?

A. Yes, sir.

Q. When, as a matter of fact, there was stuff on the crown-sheet, wasn't there?

A. Let me understand you.

Q. After you made this report on engine 473, after you made the report, it developed that there was stuff, filings and scrapings, etc., on the crown-sheet of engine 473, wasn't there?

A. Yes, sir.

Q. While its crown-sheet was in that condition, your report was in with the Government showing everything O. K., wasn't it?

A. Yes, sir; I think it was. I inspected it."

To which ruling of the Court in permitting the witness to be cross-examined, as above set forth, the defendant, by counsel, excepted, and tendered this its Bill of Exceptions No. 14, which is signed, sealed and made a part of the record, this 18th day of November, 1914.

W. W. Moffett, Judge. (Seal)

Maude L. Andrews, Admx. of A. W. Andrews, dec'd.,

v.

The Virginian Railway Company.

[926] BILL OF EXCEPTIONS No. 15.

Be it remembered that upon the trial of this case, the witness H. L. Thomas, was introduced by the defendant to maintain the issue on its part, and after the witness had testified that according to the custom and practice that prevailed among the engineers, that under certain circumstances he would put on his left injector himself, and that under certain other circumstances he would direct the fireman to put it on, he was asked, by defendant's counsel, the following question:

> "Q. Mr. Thomas, if an engineer discovered that his water is getting so low as to present the danger of leaving his crown-sheet uncovered, and of the water getting below the crown-sheet, and he wants to put on his left injector—the right one being on—would he call to the fireman to put that left injector on, or would he go across and put it on himself?"

To which the plaintiff objected, and the Court sustained the plaintiff's objection; and the defendant stated that it expected to prove by this witness, in answer to said question that under the circumstances named in the question the engineer would put the left injector on himself and would not trust the fireman to do it; to which

[927] ruling of the Court in sustaining plaintiff's objection to said question, and in not permitting the witness to answer the said question, the defendant, by counsel, excepted, and tenders this its Bill of Exceptions No. 15, which is signed, sealed and made a part of the record, this 18th day of November, 1914.

W. W. Moffett, Judge. (Seal)

Maude L. Andrews, Admx. o fA. W. Andrews, dec'd.,

v.

The Virginian Railway Company.

[928] BILL OF EXCEPTIONS No. 16.

Be it remembered that upon the trial of this case, the defendant, to maintain the issue on its part, introduced the witness, N. W. Sample, whose testimony is set forth at large in Bill of Exception No. 1, which is hereby referred to as a part hereof, the said witness was asked and answered the following question:

"Q. Now, the evidence is here that that crown-sheet has been buckled or forced down to the extent of 10¾ inches from its normal position. Now, could that sheet have been forced in that position cold; that is, with water on top of it, by any steam pressure that could be developed by an explosion when the engine was set for 185 pounds pressure? In other words my question is, could that sheet be forced down in the shape it is when the sheet was cold by 185 pounds pressure?

A. No, sir; I do not think it could, because we have a great deal heavy flanging to do like that at the works, and in order to put that set in a plate of that description, or a set anything like it, we have to put the sheet in a flanging press of about a thousand ton capacity."

[929] And thereupon the plaintiff, by counsel, objected to the answer of the witness, on the ground that the witness could not give testimony as to an experiment of the kind mentioned in his answer when the conditions are entirely different, and the Court sustained the objection of the plaintiff's counsel to said evidence; to which ruling of the Court in sustaining the objection of plaintiff's counsel to said evidence, the defendant, by counsel, excepted, and tenders this its Bill of Exceptions No. 16, which is signed, sealed and made a part of the record, this 18th day of November, 1914.

W. W. MOFFETT, Judge. (Seal)

Maude L. Andrews, Admx. of A. W. Andrews, dec'd.,

v.

The Virginian Railway Company.

[930] BILL OF EXCEPTIONS No. 17.

Be it remembered that upon the trial of this case, the defendant, to maintain the issue on its part, introduced the witness John Doarnberger, whose testimony is set forth at large in Bill of Exception No. 1, which is hereby referred to as a part hereof, and after the witness L. S. Randolph had testified for the plaintiff that he had seen the crown-sheet which had been blown down on the Norfolk Western Railroad near Alleghany Tunnel, and the witness Doarnberger had testified that said crown-sheet was blown down from low water, the defendant, by counsel, asked the witness Doarnberger the following question:

"Q. How did the bolts on that blown down crown-sheet break? Did they break down in the head like these, or square off, or some other way?"

To which question the plaintiff, by counsel, objected, and thereupon the defendant, by counsel, stated that it expected the witness to answer that the bolt heads broke down in the heads of the bolts, or under the heads of the bolts, in the same way that the bolt heads which he had before him and which he has pointed out as being the hottest ones which were broken; but the Court sustained the plaintiff's
[931] objection to said question and refused to allow the witness to answer the same, to which ruling of the Court in sustaining the plaintiff's objection to said question the defendant, by counsel, excepted, and tenders this Bill of Exceptions No. 17, which is signed, sealed and made a part of the record, this 18th day of November, 1914.

W. W. MOFFETT, Judge. (Seal)

Maude L. Andrews, Admx. of A. W. Andrews, dec'd.,
v.
Virginian Railway Company.

[932] BILL OF EXCEPTIONS No. 18.

Be it remembered that upon the trial of this case, the defendant to maintain the issue on its part, introduced the witness F. T. Slayton, whose testimony is set forth at large in Bill of Exceptions No. 1, which is hereby referred to as a part hereof, and the defendant, by counsel, asked the said witness the following question:

"Q. Please state whether or not it is customary among engineers, and all engineers in service know that it is customary among them, and that they do actually perform the duty of inspecting their water glass and testing it before they start out on a run."

To which question the plaintiff, by counsel, objected, and thereupon the defendant, by counsel, stated that it expected to prove by this witness, in answer to the foregoing question, that it is the duty of the engineer to test his water glass before starting out on his run; that the custom is for engineers to perform this duty and to always test their water glass before starting out on their run; but the Court sustained the objection of counsel for plaintiff to said question and
[933] refused to permit the witness to answer the same; to which ruling of the Court in sustaining said objection the defendant, by counsel, excepted, and tenders this its Bill of Exceptions No. 18, which is signed, sealed and made a part of the record, this 18th day of November, 1914.

W. W. MOFFETT, Judge. (Seal)

Maude L. Andrews, Admx. of A. W. Andrews, dec'd.,

v.

Virginian Railway Company.

[934] BILL OF EXCEPTIONS No. 19.

Be it remembered that upon the trial of this case, the plaintiff, to maintain the issue on her part, introduced in rebuttal the witness L. S. Randolph, whose evidence is set forth at large i nBill of Exceptions No. 1, which is hereby referred to as a part hereof, and over the objection of counsel for defendant, the Court permitted the said witness, in answer to questions asked by plaintiff's counsel, to testify as follows:

"Q. How is it possible to stop a leak in a crown-sheet without taking it through the shop?

A. I have frequently stopped leaks in the stays in the flue-sheet by putting in saw-dust or bran or any fibrous thing of that kind; saw-dust and bran I always prefer, because that could be put in through the injector or fed through there (indicating), and I have known, in fact, frequently myself out on the road with a leaky fire box, I have gotten saw-dust and put it in the tender and fed it through and stopped a leak so we could go on.

Q. How bad leaks have you seen stopped in that way?

A. Several times when the engine was failing for steam we have been able to stop the leaks sufficiently to get up the steam and go ahead."

[935] To which ruling of the Court in permitting said witness to answer said questions, over the objection of defendant's counsel, the defendant' by counsel, excepted, and tenders this its Bill of Exceptions No. 19, which is signed, sealed and made a part of the record, this 18th day of November, 1914.

W. W. Moffitt, Judge. (Seal)

Maude L. Andrews, Admx. of A. W. Andrews, dec'd.,

v.

The Virginian Railway Company.

[936] BILL OF EXCEPTIONS No. 20.

Be it remembered that upon the trial of this case, after the plaintiff, to maintain the issue joined on her part, had introduced her evidence in chief, and after the defendant, to maintain the issue joined on its part, had introduced the evidence of sundry witnesses, all of

which evidence is set forth at large in Bill of Exceptions No. 1, which is hereby referred to as a part hereof, the defendant, to further maintain the issue joined on its part, offered the following evidence of C. M. Butler and W. R. Moore, the witnesses being examined outside of the presence of the jury:

THURSDAY, OCTOBER 8, 1914, 9:30 A. M.—MORNING SESSION.

At this point a witness named C. M. Butler was sworn for the defendant, and the following evidence was taken out of the presence of the jury, as follows:

[937] C. M. BUTLER.

C. M. Butler, sworn, for Defendant:

DIRECT EXAMINATION.

By Mr. Hall:

Q. Mr. Butler, what railroad company are you employed by now?

A. The Atlantic Coast Line.

Q. How long have you been with the Atlantic Coast Line?

A. Eighteen years next February.

Q. Was A. W. Andrews ever employed by the Atlantic Coast Line Railway?

A. Yes, sir.

Q. In what capacity?

A. Engineer.

Q. What were your duties then in connection with engineers?

A. Employing engineers and looking after their records and keeping track of and handling discipline.

Q. When did Mr. Andrews leave the employment of the Atlantic Coast Line?

A. April the 26th, 1906, was the date of his discharge.

Q. Was he discharged?

[938] A. Yes, sir; he was discharged.

Q. What was he discharged for?

A. For his responsibility in connection with blowing down crown-sheet of engine 370.

Q. Had he burned the crown-sheet and blown it down?

A. The crown-sheet was burned and blown down while the engine was in his charge.

Q. What was his record as an engineer outside of the blowing

A. We did not consider it good; he had had a number of disciplines administered for various causes, some of which were for overlooking meeting orders with other trains; all of which would indicate that he was an unsafe man.

Q. What effect does it have on the character and reputation of an engineer, on his ability to obtain employment as an engineer, to be guilty of blowing down a crown-sheet?

A. In engineer's parlance, it is considered the worst crime he could commit in railroading.

Q. Does that affect his character and standing as an engineer and his ability to obtain employment in that line?

A Yes, sir.

Q. Does it affect it more seriously than anything else?

A. It is even worse, from an engineer's standpoint, than meeting another train; in other words, engineers would rather have anything against them than the charge of burning an engine.

By Mr. Hall:

That is all that we want to ask the witness.

By Mr. Hunt:

Counsel for plaintiff object to the foregoing testimony, because the witness singles out an isolated act which he alleges in his opinion the engineer committed. This testimony is certainly not admissible to show that the probability was that the decedent was guilty [939] of negligence or carelessness at the time of the failure of the crown-sheet which resulted in his death. If the evidence is offered for the purpose of showing the decedent's earning capacity was small, it is also objectionable unless witness is shown to have personal knowledge of the facts about which he has testified and not if he is simply testifying from information he received from others. Therefore, counsel for the plaintiff cross-examines the witness for the purpose of ascertaining the source of his information and the accuracy thereof. Even if the witness had personal knowledge of the specific act of negligence of the decedent, still his testimony should be confined to the statement whether or not he knew the capacity of the decedent and knew whether or not he was a careful workman in the discharge of his duties, and if he thinks not, should so state to the jury whether or not the decedent was a careful workman in his opinion.

CROSS-EXAMINATION.

By Mr. Staples:

Q. Mr. Butler, where were you when the crown-sheet was

blown down about which you are speaking?

A. I was in Wilmington.

Q. Where was the crown-sheet blown down?

A. In Virginia, on the Richmond district.

Q. Do you know where Mr. Andrews was at that time, of your own personal knowledge?

A. As an ocular fact, I do not know where he was.

Q. What was the source of your information?

A. The source of my information is that the train sheet showed that he was on that engine; all the records show that he was running it; his own personal statement at the investigation said that he was running it; his time ticket showed his name on it; and there is no question of a doubt of his being on the engine, though I was not there to see him on the engine.

Q. Who made the investigation of the accident?

A. The superintendent, together with the mechanical department, made it.

Q. Who kept the records?

A. It was done under my supervision in the office.

Q. Did you make any of them?

A. Yes, sir.

Q. Which ones did you make?

A. All of them.

Q. Have you them with you?

A. Yes, sir.

Q. I would like to see them, please.

[941] A. Here is a list of the records.

Q. Does the record which you refer to consist of a letter of November 23rd, 1906, from S. M. T. to Mr. W. S. Teat, M. M., of the L. & N., Blue Ridge, Georgia? Is that the record of which you speak?

A. That is a statement to Mr. Teat of his record furnished him on Mr. Andrews' personal authority, which is just under that.

Q. Do you know whether the L. & N. gave him employment?

A. I do not.

Q. You do not know?

A. No, sir.

Q. As a matter of fact, haven't you heard that they did?

A. I have heard that he worked on the L. & N.; I have heard it said that he did, since I have been here; but I did not know that he had. You will find requests for record there from other railroads.

Q. Did the Virginian Railway Company make an application

to you?

A. They did not.

Q. These are the only records you have got, these letters here?

A. I haven't got a full history of the investigation of each case, the only thing that I can state is that I know from my own personal knowledge that those investigations were made and
[942] those disciplines were administered.

Q. Though not by you?

A. Yes, sir; I issued instructions.

Q. So the investigations were not made by you?

A. No, sir.

Q. And the disciplines were not administered by you?

A. The instructions for the discipline to be administered was issued by me.

Q. But the discipline was not given by you?

A. The discipline was put in effect by the master mechanic, in whose charge he was working.

Q. Where are the records from which you got the data for these letters?

A. I don't know whether they are all on here or not. (The witness examines the file.) They are not; they are on file in the superintendent's office, where the investigations were made; only the results are on this file of papers.

Q. Isn't it a fact that Mr. Andrews stated that at the time the injury was done to the crown-sheet about which you have spoken that the glass water guage showed about two-thirds full?

A. I do not remember the details of the investigation now, but it was made about eight years ago. All I remember about it is that all the evidence presented, the company considered Mr. Andrews to be an unsafe man on a locomotive engine.

Q. That is not the question I asked you.

[943] A. I just simply told you I did not remember all of it; the statement is there, but I do not remember that from my own personal knowledge.

Q. I want you to read here the examination or questions which were propounded to Mr. Andrews and the answers which he made thereto, and see if he does not say at the time that engine went down the left injector was working and the glass guage was two-thirds full of water?

A. "How much water did you have in your boiler?" was the question asked him, and his reply was, "The water glass showed the boiler about two-thirds full."

Q. Now go on, what does he say about the injector?

A. "How long since you had worked the injector?" and his answer was, "The injector was working when the engine blew up; put on the injector at Fox and it had not been shut off; engine steaming good, and no occasion to shut off injector."

Q. The failure of the crown-sheet was a very mild one, wasn't it?

A. Yes, sir; the engineer was not killed, of course, or he wouldn't have been here if he was.

Q. Isn't it true that it was not sufficiently violent to require the engineer to leave the cab?

A. Yes, sir; it blew him out of the front door, by his own statement. I think you will find he said that in there.

Q. It got so strong he had to go out of the front window.

[944] It says, "Something went wrong with the fire box. I did not know what it was at first, it got so strong I had to go out of the front window; I came back and got a hold of the brake and stopped the train; after I stopped, looked into the fire box, face of crown-sheet was down." Isn't that his description of the accident?

A. Yes, sir.

Q. You don't know whether that occurred from low water or not do you?

A. I know as well as anything in this world is known, from all th evidence brought to bear on it, that was the decision of people that were competent to judge.

Q. I asked you your personal knowledge?

A. I haven't any personal knowledge of anything except the facts surrounding it.

Q. I didn't ask you to express the opinion of other people when you in your opinion are competent to judge.

A. You understand a railroad is run and facts are obtained and results are gotten from those facts and we act on the facts we get.

Q. If the glass water guage showed the boiler two-thirds full as Mr. Andrews states, then it did not occur from low water, did it, if the water glass was in good condition?

A. Those are statements that were made by Mr. Andrews. I don't know whether they were true or not; I couldn't say that they were not.

Q. I will ask the stenographer to read the question to

[945] you and will ask you to listen to the question and maybe you can answer it.

(Question is here read to the witness.)

A. As I stated, the fact that he says the water glass was two-

thirds full, the fact that an engineer states that the water glass showed the boiler to be two-thirds full, does not make that a fact.

Q. I am going to ask the stenographer to read the question to you again and see whether the witness can let it soak into his brain, as to what it means. Read the question, please.

(Question is again read to the witness.)

A. I am unable to answer the question. I do not see how I am going to answer it in any different way. You are making an hypothesis, and I cannot answer it any other way.

Q. Well, if the hppothesis be true?

A. If the boiler were two-thirds full?

Q. (Interposing.) Then it did not occur from low water, did it?

A. Why, I don't know where that would put the water on the crown-sheet.

Q. Do you mean to say that you are not familiar enough with the construction of a crown-sheet and boiler of an engine to know the fact that if there is any water at all in the water glass, that the water is three inches over the top of the crown-sheet?

[946] A. I know when there is water in the water glass that the water is over the crown-sheet, but I don't know whether it is two-thirds full of the boiler; I don't know how much water it takes to cover over a crown-sheet as a proportional part of the whole amount in the boiler.

Q. Don't you know that when the water glass registers any water at all that means it has three inches over the top of the highest point of the crown-sheet?

A. Yes, sir; if the water is in the water glass coming through the lower opening, it shows water over the crown-sheet.

RE-EXAMINATION.

By Mr. Hall:

Q. The fact is that Mr. Andrews was discharged for burning a crown-sheet?

A. Yes, sir.

Q. And that he knew he was discharged for burning a crown-sheet?

A. Yes, sir; he was told so.

Q. And that he applied over his personal signature for that record showing that he was discharged for burning a crown-sheet?

A. Yes, sir.

By Mr. Hunt:

Q. Isn't it true that all the information you have on this subject and concerning which you have testified, is information derived from this pile of letters, data from which was supposed to [947] be gotten by others than yourself, and from records made somewhere in the offices of the Atlantic Coast Line Railroad? That is a fact, isn't it?

A. No, sir; I originated most of these papers, myself, and I had other information to get it from.

Q. Those letters?

A. Yes. You understand, Mr. Hunt, that we, in operating a railroad, have to depend on other outside information to get at the facts, and when we get the information and have given everybody a fair chance, why we don't just ruthlessly discharge a man without knowing what we are doing it for, you know. We do not have to see a thing with our own personal observation in order to ascertain facts sufficiently clear to convince us that a certain thing occurred.

Q. We do, we think enough to testify about it, that is just the distinction that I want to get in your head, the difference of making yourself a competent witness.

A. I am here to testify to facts; I came here to testify to things I know have occurred on this railroad. Now, it is immaterial to me one way or the other.

Q. It is very material to this case.

A .That is a matter with which I am not personally interested, one way or the other.

Q. But isn't it true that all the information touching this crown-sheet which you have spoken of, is information which you have gotten from others, and it is information that you do not know about yourself?

A. It is information that I have gotten from others, but [948] I think I know it.

Q. From the sources which you got it?

A. Yes, sir.

Q. You know it from no personal investigation of it?

A. I know it from a personal investigation of it, being present at the investigation.

Q. Were you present when the crown-sheet went down?

A. No, sir; after the crown-sheet had gone up.

Q. Did you examine the crown-sheet?

A. No, sir.

Q. You wouldn't know anything about it if you did examine it, would you?

A. I would know considerable about it; eighteen years in the mechanical department, you pick up a little of something.

(Witness stands aside.)

By Mr. Hall:

Now, we have one other witness that we desire to introduce on this same line, outside of the presence of the jury, and we want your Honor to pass on the admissibility of all of this evidence after we get through.

[949] W. R. MOORE.

W. R. Moore, sworn, for Defendant:

DIRECT EXAMINATION.

By Mr. Hall:

Q. With reference to this matter, I want to put Mr. Moore on and ask him one question. I show you a letter dated at Blue Ridge, Georgia, October the 7th, 1906, signed A. W. Andrews, and addressed to J. S. Chambers. I wish you would please look at the signature of Mr. Andrews there and state whether or not you are familiar with his signature and whether that is the signature of A. W. Andrews who was killed in the explosion of engine 469 on the Virginian?

A. Yes, sir; I am familiar with Mr. Andrews' handwriting, and that is his signature.

By Mr. Hall:

I desire to offer the letter and will read it.

"Blue Ridge, Georgia, 10-7-1906.

"To Mr. J. S. Chambers,
Superintendent of Motive Power,
Wilmington, N. C.

"Dear Sir:

"I have made application to the L. & N. Railway for employment in the capacity of locomotive engineer and I desire to have that company fully advised of my record with my former employers. I was in the service of your company as follows: occupation, engineer, first division, State North Carolina, from April 1st, 1904, to May 1st, 1906. Under whom employed: J. S. Chambers, Superintendent Motive Power.

And therefore request that you forward to Mr. M. P. Teat, Master Mechanic, Louisville & Nashville Railway Company, Geor-

gia, a statement containing all information that you may have as to my personal character, habits and ability, also the cause of my leaving the employ of your company. I hereby release your company from all and any liability for damage of whatsoever nature on account of furnishing the information above requested, which is to be used in determining my fitness for the position mentioned.

Yours truly,

A. W. ANDREWS."

Witness: L. B. Slaughter.

(Witness stands aside.)

## QUESTIONS TO MR. C. M. BUTLER.

By the Court:

Q. Did I understand Mr. Butler to say that when he answered this letter he sent a copy of all these letters to the L. & N.?

A. No, sir; I just sent a transcript of those letters; that is the record.

Q. Did you write it yourself?

A. Yes, sir; at least the chief clerk wrote it but signed the superintendent of motive power's name to it.

Q. Who does that letter show it was from, the superintendent of motive power, doesn't it?

A. Yes, sir.

By Mr. Hall:

Q. Who signed the letter?

A. I did.

By Mr. Staples:

We still object to the evidence.

[951] Objection sustained. Defendant excepted.

By the Court:

I think, Mr. Hall, you have got the right to show that Mr. Andrews was not receiving the amount of money it has been shown he was receiving, and did not work so many days that they said he worked, and that he was sick and on account of his frail constitution he could not earn the money they claimed he earned.

Defendant excepted.

By Mr. Staples:

We desire the record to show that counsel for plaintiff do not

object to their proving that Mr. Andrews was a careless workman by any person who had actual knowledge of his habits, from being thrown in contact with him.

[952] To the introduction of all of which before the jury the plaintiff, by counsel, objected, and the Court sustained the plaintiff's objection and refused to allow the said evidence, or any part thereof, to be introduced before the jury; to which ruling of the Court in excluding said evidence from the consideration of the jury, the defendant, by counsel excepted, and tenders this its Bill of Exceptions No. 20, which is signed, sealed and made a part of the record, this 18th day of November, 1914.

W. W. MOFFETT, Judge. (Seal)

And at another day, to-wit: May 8th, 1914.

Maude L. Andrews, Adm'rx.,

v.

Virginian Railway Company.

[953] ORDER.

This day came the plaintiff and the defendant, by their attorneys, and upon the plaintiff's motion it is ordered that the defendant file such pleadings as it may desire during the pendency of this term, or within thirty days thereafter; and by agreement of counsel this cause is made a vacation cause, so that any question of law which may arise for the consideration of the Court from said pleadings may be considered and determined during the ensuing vacation, in order that the cause may be matured and ready for hearing at the July term.

We consent to the above.

VIRGINIAN RAILWAY COMPANY,
By HALL & WOODS, Attorneys;
MAUDE L. ANDREWS,
Adm'rx. of A. W. Andrews, dec'd.,
By ABRAM P. STAPLES, JR., Attorney.

And at another day, to-wit:

Maude L. Andrews, Administratrix of A. W. Andrews, deceased,

v. Case.

The Virginian Railway Company.

[954] ORDER, 5th OCTOBER.

This day came again the parties, by their attorneys, and the defendant Company for plea says it is not guilty in manner and form as against it in the declaration is alleged, and of this it puts itself upon the country, and the plaintiff doth the like. And thereupon came a jury, to-wit: S. W. Kinzie, W. S. Hawley, Walter Saville, Jno. E. Albert, Jr., Joseph Akers, M. F. Harvey, and William Wall, who were elected, tried, and sworn the truth to speak upon the issue joined. And not having time to hear the evidence, the jury is adjourned over until tomorrow morning at half past 9 o'clock.

Before the plea was entered and the jury sworn, the demurrer to the fourth count was sustained, by consent of parties, to the concluding cause of the declaration.

And at another day, to-wit:

Maude L. Andrews, Adm'rx.,
v. Case.
The Virginian Railway Company.

[955] ORDER, 6th OCTOBER.

This day came again the parties, by their attorneys, and the jury adjourned over on yesterday appeared in Court pursuant to their adjournment, and having partially heard the evidence, but not having time to fully hear the same, are adjourned over until tomorrow morning at half past 9 o'clock.

And at another day, to-wit:

Maude L. Andrews, Adm'rx.,
v. Case.
The Virginian Railway Company.

[956] ORDER, 7th OCTOBER.

This day came again the parties, by their attorneys, and the jury adjourned over on yesterday appeared in Court pursuant to their adjournment, and having further heard the evidence, and not having time to fully hear the same, are adjourned over until tomorrow morning at half past 9 o'clock.

And at another day, to-wit:

Maude L. Andrews, Adm'rx.,

v. Case.

The Virginian Railway Company.

[957] ORDER, 8th OCTOBER.

This day came again the parties, by their attorneys, and the jury adjourned over on yesterday appeared in Court pursuant to their adjournment, and having further heard the evidence and not having time to fully hear the same, are adjourned over until tomorrow, Friday, morning at half past 9 o'clock.

And at another day, to-wit:

Maude L. Andrews, Adm'rx.,

v.

The Virginian Railway Company.

[958] ORDER, OCTOBER TERM, 1914 (9th Oct.).

This day came again the parties, by their attorneys, and the jury adjourned over on yesterday appeared in Court pursuant to their adjournment, and having further heard the evidence, but not having time to fully hear the same, are adjourned over until tomorrow morning at 9 o'clock.

And at another day, to-wit:

v.

The Virginian Railway Company.

[959] ORDER, OCTOBER TERM, 1914 (10th Oct.).

This day came again the parties, by their attorneys, and the jury adjourned over on yesterday appeared in Court pursuant to their adjournment, and having fully heard the evidence, but not having time to hear the argument of counsel, are adjourned over until Monday morning, October 12th, at 11 o'clock.

And at another day, to-wit: October 12th.

Maude L. Andrdews, Administratrix of A. W. Andrews, deceased,

v. Case.

The Virginian Railway Company.

This day came again the parties, by their attorneys, and the jury adjourned over on yesterday appeared in Court pursuant to their adjournment, and having fully heard the instructions of the

Court and argument of counsel, retired to their room to consider of their verdict, and after some time returned into Court and presented the following verdict:

"We, the jury, find for the plaintiff and against the defendant and assess her damages at the sum of Twenty Thousand Dollars ($20,000.00), and apportion the same as follows:

To Maude L. Andrews (widow)....$4,000.00
To Arthur W. Andrews (child).....$4,000.00
To Martha J. Andrews (child).....$4,000.00
To Peyton C. Andrews (child).....$4,000.00
To Macon C. Andrews (child).....$4,000.00.

M. F. Harvey, Foreman."

And thereupon the defendant, by counsel, moved the Court to set aside said verdict and grant it a new trial because:

(1) The Court erred in admitting improper evidence before the jury over the objection of the defendant;

(2) The Court erred in refusing to admit before the jury proper evidence offered by the defendant;

(3) The Court erred in refusing to give to the jury proper instructions offered by the defendant;

(4) The Court erred in giving improper instructions to the jury over the objections of the defendant;

(5) The verdict is contrary to the law and the evidence;

(6) The verdict is excessive.

[961] Which motion the Court overruled, to which ruling of the Court the defendant excepted.

Whereupon it is considered by the Court that the plaintiff, Maude L. Andrews, Administratrix of A. W. Andrews, deceased, do have and recover of the defendant, The Virginian Railway Company, the sum of Twenty Thousand Dollars ($20,000.00) with interest thereon from the 12th day of October, 1914, until paid, and her costs in this behalf expended.

It is further considered by the Court that pursuant to the verdict of the jury aforesaid, that the Twenty Thousand Dollars herein awarded as damages, shall be apportioned as follows: To Maude L. Andrews, widow, and each of her four children, to-wit: Arthur W., Martha J., Peyton C., and Macon Andrews, the sum of Four Thousand Dollars, aggregating the said sum of Twenty Thousand Dollars.

The defendant indicating its purpose to apply to the Supreme Court of Appeals for a writ of error and supersedeas to this judgment, on motion of the defendant, the operation of this judgment is suspended for seventy-five (75) days from the rising of the Court,

[962] upon the defendant, or some one for it, executing a bond before the Clerk of this Court, with security approved by him, in the penalty of One Thousand Dollars ($1000.00), and conditioned and payable according to law.

*Memo.*—Upon the trial of the case the defendant excepted to sundry rulings of the Court, and by consent of the parties hereby entered of record and agreed upon by the parties, the defendant is allowed forty-five days from the rising of the Court within which to file its bills of exception.

In vacation in the Circuit Court of Montgomery County, November 18, 1914.

Maude L. Andrews, Administratrix of A. W. Andrews, deceased,

v.

The Virginian Railway Company.

[963] This day came the parties, by their attorneys, and the defendant presented its Bills of Exceptions Nos. 1 to 20, inclusive, to be signed, sealed and made a part of the record, which is accordingly done, and it is ordered that said Bills of Exceptions be filed in the Clerk's Office of this Court and made a part of the record in this case.

To the Clerk of the Circuit Court of Montgomery County, Virginia:

Enter the foregoing order in vacation.

W. W. MOFFETT, Judge.

November 18, 1914.

[964] I, Geo. W. Wilson, Clerk of the Circuit Court in and for the County of Montgomery in the State of Virginia, do hereby certify that the foregoing is a true and correct copy of so much of the record as I have been directed to copy in the case of Maude L. Andrews, Administratrix of A. W. Andrews, deceased, versus The Virginian Railway Company, lately determined in my said Court.

I do further certify that The Virginian Railway Company has caused legal notice of its intention to apply for the transcript of this record to be served on counsel for Maude L. Andrews.

Given under my hand this 2nd day of December, 1914.

GEO. W. WILSON, Clerk.

Clerk's fee for record, $195.00.

A Copy, Teste:

J. M. KELLY, C. C.

The foregoing printed record or transcript of proceedings contains a true and correct copy of the evidence contained in the defendant's demurrer to the evidence and therein referred to as "Exhibit Record," and contains also a true and correct copy of all pleadings, orders and proceedings up to and including the 2nd day of December, 1914, in the common law action of Maude L. Andrews, administratrix of A. W. Andrews, deceased, against the Virginian Railway Company, a corporation, and a true and correct copy of all pleadings, orders and proceedings subsequent thereto is contained in the remaining part of the transcript of the record in said cause, this day certified by me, along with the foregoing, to the Supreme Court of the United States.

Given under my hand this 5th day of December, 1916.

CHAS. D. DENIT,
*Clerk of the Circuit Court of Roanoke County, Virginia.*

UNITED STATES OF AMERICA,
*Circuit Court of Roanoke County (Virginia), ss:*

In obedience to the commands of the within writ, I herewith transmit to the Supreme Court of the United States a duly certified transcript of the complete record and proceedings in the within entitled case, with all things concerning the same.

In witness whereof, I hereunto subscribe my name and affix the seal of the said Circuit Court for Roanoke County, in the county of Roanoke, this 5th day of Dec., 1916.

[Seal Circuit Court, Roanoke County, Virginia.]

CHAS. D. DENIT,
*Clerk of the Circuit Court for the County of Roanoke, Virginia.*

Costs of this record: $14.20.

Paid by A. P. Staples, counsel for Maude L. Andrews, Administratrix A. W. Andrews, deceased.

VIRGINIA:

In the Supreme Court of Appeals, Held at the Library Building, in the City of Richmond, on Thursday, the 13th Day of January, 1916.

THE VIRGINIAN RAILWAY COMPANY, Plaintiff in Error,
against
MAUDE L. ANDREWS, Administratrix of A. W. Andrews, Deceased, Defendant in Error.

Upon a Writ of Error and Supersedeas to a Judgment Rendered by the Circuit Court of Montgomery County on the 12th Day of October, 1914.

This day came again the parties by counsel and the Court having maturely considered the transcript of the record of the judgment

aforesaid, and argument of counsel, is of opinion for reasons stated in writing and filed with the record that the said judgment is erroneous. It is therefore considered that the same be reversed and annulled, the verdict of the jury set aside, and the case is remanded for a new trial to be had not in conflict with the views expressed in the said written opinion of the Court. It is further considered that the Plaintiff in error recover of the defendant in error its cost by it expended about the prosecution of its writ of error and supersedeas aforesaid here. This is ordered to be certified to the said Circuit Court.

A Copy.

H. STEWART JONES, *C. C.*

*Opinion of Court of Appeals.*

Circuit Court of Montgomery County.

Opinion by Judge Stafford G. Whittle.

THE VIRGINIAN RAILWAY COMPANY

v.

MAUDE L. ANDREWS, Administratrix of A. W. Andrews, Deceased.

RICHMOND, VA., January 13, 1916.

The right of the defendant in error, who was the plaintiff below, to recover damages for the death of her intestate was rested upon the grounds stated in a declaration containing four counts. The Court sustained a demurrer to the fourth count, and, without objection, instructed the jury that there was no evidence to sustain the second Court so that the case was tried on the first and third counts.

(1) The first count alleges that the stay-bolts supporting the crown-sheet were made of defective material, and that the workmanship was faulty; and that they had been weakened and rendered unsafe by previously having been burned. (2) And the third count alleges that the glass water-gauge was out of repair and in an unsafe condition, the valves therein being stopped up with lime, trash or other deposits, and improperly registered the quantity of water in the boiler. Both these counts are founded on an act of Congress approved February 17, 1911, entitled, "An act to promote the safety of employes and travelers by compelling common carriers engaged in interstate commerce to equip their locomotives with safe and suitable boilers and appurtenances thereto."

The following is an outline narrative of the salient facts: The engine which is the subject of investigation was one of ten engines built for the defendant by the Baldwin Locomotive Works, which is one of the largest and most reliable manufactories of engines in the United States. At the time of the accident the engine was practically new, having been used for the first time in May, 1912. It

was constructed with great care, both with respect to material and workmanship; and, during the course of construction, in every detail, was subjected to rigid inspection by experienced inspectors detailed by the defendant for that service. The specifications called for a crown-sheet for the engine with a margin of safety of 13.3 under steam pressu-e of 200 pounds. The engine was being operated with a steam pressure of 185 pounds, and, properly handled, was capable of withstanding a pressure of about sixteen times the pressure to which it was subjected at the time of the accident. The inspectors tested the tensil strength of the materials used in the crown-sheet and stay-bolts before they were put in the engine, and found them of the required strength. After the engine had been completed, the boiler was thoroughly tested with water and steam, and likewise proved satisfactory. It was then washed out with soda and cleansed of grease, oil and other foreign substances used in, and which collected during, the course of construction. The engine was practically in the control of plaintiff's intestate and run by him during the entire time it was in operation. On November 11, 1912, three days prior to the accident, it was inspected by government inspectors under the act of Congress, which inspection showed that the engine boiler and appurtenances were in perfect condition. From the time of that inspection until the explosion, the engine was exclusively operated by Engineer Andrews. In the interval he made two trips from Princeton, West Virginia, to Roanoke, Virginia, and return, and had run the engine back to Roanoke. On November 14, 1912, at 9:30 p. m., he left the latter city for Princeton, pulling three loaded cars and seventy-nine empties, and had proceeded about eighteen miles on his journey when the explosion happened. In addition to the inspections provided for by the Boiler Act, the defendant enjoined upon the engineer the duty to inspect his own engine, and at the end of each run to make a written report of its condition. Accordingly, in obedience to that rule, when the engineer arrived at Roanoke on the morning of November 14, he made his report that he had carefully inspected the engine and its appurtenances and found it in good condition, with the exception of certain unimportant defects to which attention was called, and which were speedily repaired. There was no suggestion in the report of any defect in the crown-sheet. Moreover, on the night of the accident, the hostler examined the crown-sheet before turning over the engine to the engineer, and discovered no defects in it; after the engineer took charge of the engine, shortly before setting out from Roanoke, he again examined the crown-sheet.

It thus appears from the undisputed evidence that at 9:30 p. m., the time of departure for Princeton, just one hour before the explosion, the defendant had complied with every requirement of the Boiler Act, and the locomotive engine, boiler and appurtenances measured up to statutory standard.

After the explosion the engine was hauled to Princeton by another engine. The cab was boxed up as required by the Boiler Act, and the engine, boiler and appurtenances remained in the condition in which they were found after the explosion until November 16

and 17, when they were inspected by two government inspectors set out for that purpose by the Interstate Commerce Commission. These officials made their report and also testified at the trial, and proved that apart from the injury caused by the explosion the boiler and all its appurtenances, including the injectors which carried water from the tank to the boiler, and the glass water gauge were in perfect condition. These inspectors were furthermore of opinion that the explosion was unquestionably due to low water in the boiler. This opinion was concurred in by a number of other witnesses of wide experience in the observation of crownsheets blown down from low water in the boiler. Indeed, the concensus of opinion — witnesses on both sides was that the crown-sheet had been burned—that is to say, it had been heated with no water on top of it—though the expert witnesses for the plaintiff testified that the color of the crown-sheet indicated that it had been burned prior to the time of failure, and had water on it when actually failed. They were also of opinion that the presence of oil, or perchance some other foreign matter in the boiler, made it possible to burn the crown-sheet though covered with water. But these theories were refuted by the positive evidence that the crown-sheet had not previously been burned, and that there was no oil or other foreign substance in the boiler at the time of the failure. As remarked, the engine left Roanoke an hour before the accident in good condition, and there was no evidence of leakage during the short run of eighteen miles, which would necessarily have been the case had the theory of the experts that the crown-sheet had been previously burned been correct.

It is insisted on behalf of the plaintiff that in legal intendment the Boiler Act is not to be distinguished from the original Safety Appliance Act of March, 1893, and amendments, and the Employers' Liability Act of 1908. These latter acts have been construed by the Supreme Court of the United States to impose upon the carrier the absolute duty to provide and maintain proper couplers and other appliances therein mentioned at all times and under all circumstances. St. L. I. M. & S. Ry. Co. v. Taylor, 210 U. S. 281, 52 L. Ed. 1061; C. B. & Q. R. Co. v. U. S., 220 U. S. 559, 55 L. Ed. 582; Delk v. St. L. & S. F. R. Co., 220 U. S. 580; and Grand Trunk Ry. Co. v. Lindsay, 233 U. S., 42.

It will be observed that the safety appliances considered in the foregoing and analogous cases, either work automatically, as couplers which operate by impact, or else are simple contrivances, as drawbars and the like, which are the objects rather than the subjects of action, and when once placed in position remain intact and discharge their functions until changed by some active agency. A locomotive engine, on the other hand, however perfect its condition, may be, in its operation calls for the continuous exercise of a high degree of skill and experience, and the constant supervision and attention of the engineer. In other words, the two classes of instrumentalities are so inherently diverse in character and use that rules which would be reasonable and appropriate in respect to the one class would be impossible of practical application to the other. The avowed object of the Boiler Act, it is true, is to promote the safety of employees

and travelers, and to that end section 2 declares that from and after July 1, 1911, it shall be unlawful for any common carrier to use any locomotive engine propelled by steam power in moving interstate or foreign traffic unless the boiler and appurtenances thereof are in proper condition and safe to operate in the service to which the same is put, that the same may be employed the active service of such carrier in moving traffic without unnecessary peril to life and limb. When, therefore, the carrier has discharged his statutory duty to the engineer by turning over to him a locomotive engine and boiler and appurtenances in proper condition and safe to operate, it is not answerable to the engineer as an insurer of his safety throughout the run; and in order for his personal representative to maintain an action for his death caused by the explosion of the boiler, the burden rests upon the plaintiff to show that the defendant has been guilty of negligence charged in the declaration.

The occupants of the cab at the time of the accident were the engineer, Andrews, a brakeman, Lucas, and the fireman, Jerre Walton. The two former were killed, and the plaintiff sought to prove by Walton that the explosion resulted from defects in the crown-sheet or stay-bolts which existed prior to the accident. This witness admittedly had no familiarly with that type of engine, that being his first trip on an engine of that class; and, not to mention distractions incident to the discharge of his duties as fireman, his only opportunity for acquiring information concerning the engine, boiler and appurtenances covered an hour in time and eighteen miles in distance. He never saw the crown-sheet until after the explosion, and did not know the height of the fire-box door, or what position he would have to assume to see the crown-sheet, or whether there was a brick arch inside the engine which would obstruct the view of the crown-sheet. Nevertheless, he was permitted to express the opinion that if the crown-sheet had been burnt on that trip and made red hot there would have been a different glow in the fire-box. The opinion evidence of this witness was altogether speculative and plainly inadmissible. Virginia-Carolina Chem. Co. v. Knight, 106 Va. 674, 677, 1 Va. App. 11; Norfolk & Portsmouth Traction Co. v. Ellington, 108, Va. 245, 2 Va. App. 198.

The same is true of the evidence of the witness Richardson on the same point. Walton, also testified that the injector was working properly and supplying water to the boiler, basing his opinion on the sound it gave forth; yet he admitted that he was without experience as to injectors of that sort. He testified that the injectors and pipes leading from them into the boiler were located inside the cab, when in fact they were on the outside. Other witnesses for plaintiff testified that it required familiarity with this class of engines and ejectors for one to determine from the sound whether they were working properly or not, and that could not be done when the cab window was closed. Walton moreover testified that the water glass showed water in the boiler when the train left Roanoke, and from then to the Norfolk and Western overhead bridge, and also at Singer's tank, where he noticed it for the last time. The distance from Singer's tank to the point of accident is two and one-half miles, and

a train moving at eighteen miles an hour would cover that distance in eight minutes and twenty seconds.

It was also in evidence that though the injector was in good order, it would not automatically supply the engine with water, but to accomplish that result it was necessary for the engineer to properly adjust the valves introducing water and steam into the injector, and unless that was done the water would not be forced into the boiler but would escape through the waste pipe; and, furthermore, if that precaution was neglected, that the interval of time which elapsed between Singer's tank and the point of accident was sufficient for the crown-sheet to become exposed from lack of water, in which event the explosion would have been inevitable.

We shall not extend this opinion by entering upon a detailed analysis of the evidence of expert witnesses for the plaintiff. The trial court allowed great latitude in their examination, and numerous theories were advanced as to what possibly might have caused the accident. However, it is enough to say that a painstaking examination of this evidence shows that the opinions of the witnesses were neither founded upon facts within their own knowledge, or established by other evidence in the case. Hence, their conclusions were matters of speculation, and possessed no evidencial value. Such statements violate the fundamental principle (so often accentuated in opinions of this Court) that an inference can not be drawn from a presumption. A verdict resting upon such foundation is not the fruit of evidence, but of conjecture and can not be upheld.

"Before the opinion of an expert, based on facts to which he has not himself testified, can be admitted, he must fully understand the facts already proved, and his testimony must come in response to a hypothetical question embodying the evidence." City of Richmond v. Wood 109 Va. 75, 2 Va. App. 777.

These essential rules of evidence were not observed in the trial of this case, and there is no criterion by which to estimate the influence that this inadmissible matter may have exerted on the minds of the jury.

We are of opinion that the body of the evidence, viewed from the stand point of a demurrer to the evidence, shows that on the night of November 14, 1912, when the engine was turned over to plaintiff's intestate, the boiler and appurtenances were in proper condition and safe to operate in the service to which the same were to be put in moving traffic without unnecessary peril to life and limb, within the true intent and meaning of the act of Congress. When the explosion occurred, the locomotive engine and boiler and appurtenances were in the exclusive custody and control of the engineer and were being operated by him. In these circumstances, upon settled principles, the mere happening of the accident did not per se cast upon the defendant the imputation of negligence; but to warrant a recovery the burden rested upon the plaintiff to prove that the defendant had been guilty of the negligence alleged in the declaration.

Nor is this a case, as was pressed in argument, where the negligence of the engineer should go to mitigate the damages, but not to bar the right of action. The evidence tends to show that the negligence

of plaintiff's intestate was the sole cause, not the contributing cause, of his death, and, therefore the rule invoked under the Employers' Liability Act has no application.

We are further of opinion that the plaintiff has not successfully borne the burden of proof thus resting upon him, and that the evidence was not sufficient to warrant the verdict.

For these reasons the circuit court erred in overruling the motion of the defendant to set aside the verdict on the ground that it was contrary to the law and the evidence.

This view of the case is controlling and renders it unnecessary to discuss the subordinate assignments of error.

The judgment complained of must be reversed, the verdict of the jury set aside, and the case remanded for a new trial.

Reversed.

A Copy.
Teste:

H. STEWART JONES, *C. C.*

VIRGINIA:

Pleas before the Honorable W. W. Moffett, Judge of the Circuit Court of the County of Roanoke, in the case of Maude L. Andrews, Administratrix of A. W. Andrews, deceased, vs. The Virginian Railway Company, removed from the Circuit Court of Montgomery County to the Circuit Court of Roanoke County.

In the Circuit Court of Montgomery County, Virginia.

February 4th, 1916.

MAUDE L. ANDREWS, Adm'x,
v.
VIRGINIAN RAILWAY COMPANY.

This day came the plaintiff, by counsel, and upon her motion leave is given her to file an amendment to her declaration, said amendment consisting of three additional counts, to-wit; Count Number 5, Count Number 6 and Count Number 7.

By consent of parties it is ordered that the defendant may file, during the following vacation of this Court, any demurrers or objections it may be advised to file to said additional counts of said declaration, and said matters may be argued and disposed of during vacation.

I have seen this order.

H. T. HALL.

In the Circuit Court of Montgomery County, Virginia.

MAUDE L. ANDREWS, Adm'x,
v.
VIRGINIAN R'W'Y COMPANY.

*Amendment to the Plaintiff's Declaration Consisting of the Addition of Count Number 5, Count Number 6, and Count Number 7.*

Fifth Count.

And for this also, to-wit:

That heretofore, to-wit, on the 24th day of November, 1912, the defendant, the Virginian Railway Company, was the owner and operator of a certain line of railroad which extended from Norfolk, Virginia, to Princeton, West Virginia, and which ran and extended through the county of Montgomery, Virginia.

That at 10:20 p. m., on said day, the said defendant was running and operating a certain freight train consisting of engine No. 469, the tender thereof, three cars loaded with freight, and seventy-nine empty cars; that said empty cars and loaded cars, together with the freight contained in said loaded cars, were being transported from a point or points in Virginia, to a point or points in West Virginia, and that said train was at said time engaged in interstate commerce.

That at said time the plaintiff's intestate, A. W. Andrews, was in the employment of the defendant Railway Company as a a locomotive engineer, and was engaged in the performance of his duties as such engineer on said engine, No. 469, which was pulling said freight train as aforesaid, and that said plaintiff's intestate in his performance of his said duties at said time was engaged in interstate commerce. Whereupon, it became and was the duty of the said defendant company to have the boiler of the said locomotive, No. 469, and the appurtenances thereof in proper condition, and safe to operate at said time in the service of pulling the said train as aforesaid, without unnecessary peril to life or limb.

Yet the said defendant company, not regarding its said duty, but negligently and wilfully failing in same, did have said locomotive No. 469 at said time equipped with an unsafe boiler, and the boiler not in proper condition, said boiler being unsafe and not in proper condition to operate in the service to which the same was being put, in this, to-wit, That the stay bolts and crown bolts and bolt heads of said boiler had been previously overheated and burned and broken and were weak and unsafe and unable to withstand the ordinary pressure and strain imposed upon them by the steam which would ordinarily be generated in said boiler in the customary service of the said engine.

And the plaintiff avers that on the said 14th day of November, 1912, at about 10:20 p. m., on said day, at a point in Montgomery County, Virginia, about 300 feet west of defendant's mile post No. 264, while the said plaintiff's intestate was engaged in the perform-

ance of his said duties as engineer, on said locomotive, No. 469, in pulling said train of cars as aforesaid, the said stay bolts and crown bolts brake, and the crown sheet of the boiler of said engine No. 469 gave way as a result of said improper and unsafe condition of said bolts and bolt heads and the water and steam from the boiler of said engine and large volumes of ashes, steam and boiling water burst out of and through the stoker holes and into the cab of the engine, and scalded, injured and burned the plaintiff's intestate while he was in the cab of his engine in the performance of his duties as aforesaid, so that he suffered greatly and died therefrom on the following day.

And the plaintiff avers that Maude L. Andrews, the widow of the said A. W. Andrews, and his four children, Arthur W. Andrews, aged seven, Martha J. Andrews, aged five years, Peyton C. Andrews, aged four years, and Macon Andrews, aged one year, survive the said plaintiff's intestate, and this suit is brought for the benefit of said widow and four children.

And the plaintiff avers that the said widow and four children have been greatly damaged by reason of the death of the said A. W. Andrews, in this, to-wit, that they have been deprived of his contribution from his salary and earnings as a means of support to them, and the said children have been deprived of his services in their care and education, and they have suffered much and divers other damages in many and divers other ways therefrom.

Sixth Count.

And for this, also, to-wit:

That heretofore, to-wit: on the 14th day of November, 1912, the defendant, the Virginian Railway Company, was the owner and operator of a certain line of railroad which extended from Norfolk, Virginia, to Princeton, West Virginia, and which ran and extended through the county of Montgomery, Virginia.

That at 10:20 p. m. on said day, the defendant was running and operating a certain freight train consisting of Engine No. 469, the tender thereof, three cars loaded with freight, and seventy-nine empty cars; that said empty cars and loaded cars, together with the freight contained in said loaded cars, were being transported from a point or points in Virginia, to a point or points in West Virginia, and that the said train was at said time engaged in interstate commerce.

That at said time the plaintiff's intestate, A. W. Andrews, was in the employment of the defendant railway company as a locomotive engineer, and was engaged in the performance of his duties as such engineer on Engine No. 469, which was pulling said freight train as aforesaid, and that the said plaintiff's intestate in his performance of his said duties at said time was engaged in interstate commerce.

Whereupon, it became and was the duty of the said defendant company to have the boiler of said locomotive No. 469, and the appurtenances thereof, in proper condition and safe to operate at

said time in the service of pulling the train as aforesaid, without unnecessary peril to life or limb.

Yet the said defendant company, not regarding its said duty, but negligently and wilfully failing in same, did have said locomotive No. 469 at said time equipped with an unsafe boiler, and with a boiler not in proper condition, said boiler being unsafe and not in proper condition to operate in the service to which the same was being put, in this, to-wit: that the stay bolts and crown bolts and crown sheet were weak and unsafe and unable to withstand the ordinary pressure and strain imposed upon them by the steam which would ordinarily be generated in said boiler in the customary service of the said engine.

And the plaintiff avers that on said day the said A. W. Andrews left Roanoke, Virginia, at 9:30 p. m., and properly operated the injector on the right side of said engine continuously from the time he left Roanoke until the time of the explosion, as hereinafter set out.

And the plaintiff avers that a few minutes prior to the explosion, as hereinafter set out, the glass water gauge of said engine No. 469 properly registered and indicated that the boiler of said engine was three-fourths full of water.

And the plaintiff avers that about 10:20 p. m., of said day at a point in Montgomery County, about 300 feet west of defendant's mile post No. 264, while the said plaintiff's intestate was engaged in the performance of his duties as engineer on locomotive No. 469, in pulling said train of cars as aforesaid, the bolts of the said boiler of said locomotive broke, and failed and the crown sheet of the boiler of said locomotive gave way, while there was ample water present in the boiler over said crown sheet and bolts, and the water and steam in the boiler of said engine escaped from the boiler and rushed down into the fire box of said engine, and large volumes of ashes, steam and boiling water rushed out of and through the stoker holes into the cab of the engine and scalded, injured and burned the plaintiff's intestate while he was in the cab of his engine, in the performance of his duties as aforesaid, so that he suffered greatly and died therefrom on the following day.

And the plaintiff avers that the giving way of said crown sheet and the explosion and bursting of the boiler of said engine as aforesaid, was caused directly and proximately by the fact that the bolts and crown-sheet were in an unsafe and improper condition, as aforesaid.

And the plaintiff avers that Maude L. Andrews, the widow of the said A. W. Andrews, and his four cihldren, Arthur W. Andrews, aged seven years, Martha J. Andrews, aged five years, Peyton C. Andrews, aged four years, and Macon Andrews, aged one year, survive the said plaintiff's intestate, and this suit is brought for the benefit of said widow and four children.

And the plaintiff avers that the said widow and four children have been greatly damaged by reason of the death of the said A. W. Andrews, in this, to-wit: that they have been deprived of his contributions from his salary and earnings as a means of livelihood,

support and comfort to them; that the said widow has been deprived of his personal services in and about her daily life, and that her said children have been deprived of his services in their care and education, and that they have suffered much and divers other damage in many and divers other ways therefrom.

## Seventh Count.

And for this also, to-wit:

That heretofore, to-wit: on the 14th day of November, 1912, the defendant, the Virginian Railway Company, was the owner and operator of a certain line of railroad which extended from Norfolk, Virginia, to Princeton, West Virginia, and which ran and extended through the county of Montgomery, Virginia.

That at 10:20 on said day, the said defendant was running and operating a certain freight train consisting of engine No. 469, the tender thereof, three cars loaded with freight, and seventy-nine empty cars, that said empty cars and loaded cars, together with the freight contained in said loaded cars, were being transported from a point or points in Virginia, to a point or points in West Virginia, and that said train was at said time engaged in interstate commerce.

That at said time the plaintiff's intestate, A. W. Andrews was in the employment of the defendant railway company as a locomotive engineer, and was engaged in the performance of his duties as such engineer on said engine No. 469, which was pulling said freight train as aforesaid, and that said plaintiff's intestate in his performance of his said duties at said time was engaged in interstate commerce.

Whereupon, it became and was the duty of the said defendant company to have the boiler of said locomotive No. 469, and the appurtenances thereof, in proper condition and safe to operate at said time in the service of pulling the said train as aforesaid, without unnecessary peril to life and limb.

Yet the defendant company, not regarding its said duty, but negligently and wilfully failing in same, did have said locomotive No. 469 at said time equipped with an unsafe boiler and with the appurtenances thereof not in proper condition, said boiler and appurtenances thereof being unsafe and not in proper condition to operate in the service to which they were being put, in this, to wit: that the glass water gauge intended and ordinarily used and relied on by the engineer and fireman as registering and indicating to the engineer and fireman the quantity of water contained in the boiler of said engine at any and all times, was out of repair, and in an unsafe and improper condition, and that said glass water gauge improperly and erroneously registered the quantity of water contained in said boiler.

And the plaintiff avers that on the said day the said A. W. Andrews left Roanoke, Virginia, at 9:30 p. m. and properly operated, used and worked the injector on the right side of said engine continually from the time he left Roanoke until the time of the explosion, as hereinafter set out.

And the plaintiff avers that a few moments prior to the time of the explosion, to-wit: 10:20 p. m., as hereinafter set out, the fireman observed the glass water gauge of said engine No. 469 and said water gauge registered and indicated that the boiler of the said engine was about three fourths full of water.

And the plaintiff avers that about 10:20 p. m. of said day, and before sufficient time had elapsed since the said water glass gauge had indicated the boiler to be three fourths full of water, for said quantity of water to have been consumed or used up in steam to such an extent as to allow the crown sheet to become uncovered or free from water, and while the said train was travelling at a point in Montgomery County, about three hundred feet west of defendant's mile post No. 264, and while the said plaintiff's intestate was engaged in the performance of his duties as engineer on locomotive No. 469, in pulling the said train of cars as aforesaid, the crown sheet of the boiler of said locomotive gave way, and the water and steam in the boiler of said engine rushed down into the fire box of said engine, and large volumes of ashes, steam and boiling water rushed out of and through the stoker holes and into the cab of said engine, and scalded and injured and burned the plaintiff's intestate while he was in the cab of the engine, in the performance of his duties as aforesaid, so that he suffered greatly and died therefrom on the following day.

And the plaintiff avers that the giving way of said crown sheet, and the explosion and bursting of the boiler of said engine, as aforesaid, was caused directly and proximately by the fact that the glass water gauge of said engine was in an unsafe and improper condition, as above alleged, and incorrectly and erroneously registered and indicated that said boiler was about three fourths full of water, while the truth was that the water in said boiler was very low, and the absence of a proper quantity of water caused the stay bolts and crown sheet of said boiler to become weakened from heat and give way from the pressure of the steam as aforesaid. And the plaintiff avers that if said water gauge of said engine had properly registered the quantity of water in said boiler said plaintiff's intestate and his fireman could have used the other injector or other means for the purpose of pumping or forcing water from the tank into the said boiler, and could thus have avoided the explosion, and injury and death of the said plaintiff's intestate.

And the plaintiff avers that Maude L. Andrews, the widow of the said A. W. Andrews, and four children, Arthur W. Andrews, aged seven years, Martha J. Andrews, aged five years, Peyton C. Andrews, aged four years, and Macon Andrews, aged one year, survived the said plaintiff's intestate, and this suit is brought for the benefit of said widow and four children.

And the plaintiff avers that the said widow and four children have been greatly damaged by reason of the death of the said A. W. Andrews in this, to-wit: that they have been deprived of his contributions from his salary and earnings as a means of livelihood, support and comfort to them; that the said widow has been deprived of his personal services in and about her daily life and that

the said children have been deprived of his services in their care and education and that they have suffered much and divers other damage in many and divers other ways therefrom.

Wherefore, the plaintiff says she has been damaged in the sum of fifty thousand ($50,000.00) dollars, and hence she brings her suit.

MAUDE L. ANDREWS,
*Adm'x of A. W. Andrews, Deceased,*
By Counsel, —— ——.

A. B. HUNT,
A. P. STAPLES,
*Counsel.*

And, at another day, to-wit:

At a Circuit Court Continued and Held in and for the County of Montgomery, May Term, 1916.

MAUDE L. ANDREWS, Adm'x of A. W. Andrews, Dec'd,

**v.**

VIRGINIAN RAILWAY COMPANY.

This day came the parties plaintiff and defendant by counsel, and upon their joint motion, by consent of parties and for good cause shown to the Court, the twenty days' notice for removal being waived by all of said parties, it is ordered that this cause be removed to the Circuit Court of Roanoke County, Va.

We consent to the above order.

MAUDE L. ANDREWS,
*Adm'x of A. W. Andrews, Dec'd,*
By A. P. STAPLES AND
A. B. HUNT,
*Her Attorneys.*
H. T. HALL,
ELLETT & PHLEGAR.
G. A. WINGFIELD,
*Att'ys for the Virginian Ry. Co.*

(For Evidence See Printed Copy.)

*Demurrer to the Evidence.*

VIRGINIA:

In the Circuit Court of Roanoke County.

THE VIRGINIAN RAILWAY COMPANY

ads.

MAUDE L. ANDREWS, Administratrix.

In Case.

And the said plaintiff, by counsel, produced to the jury, to maintain the issue on her part, the following evidence, namely:

The plaintiff's evidence introduced at the former trial, as set forth from pages 43 to 157 and from pages 518 to 537, in the printed record of this case of The Virginian Railway Company v. Maude L. Andrews, Administratrix, as used on the former appeal in the Supreme Court of Appeals of Virginia, a copy of which printed record is herewith filed marked "Exhibit Record," identified by the signature of the Judge of this Court, except such of plaintiff's said testimony as was offered but not admitted in evidence, as contained in the certificate of the Judge of this Court, which is herewith filed marked "Judge's Certificate as to Evidence offered but not admitted."

And the defendant, by its counsel, produced to the jury, to maintain the issue on its part, the following evidence, namely:

The evidence set forth in said printed record, as "defendant's evidence," from page 157 to page 518.

And the said defendant says that the matters aforesaid so introduced and shown in evidence to the jury are not sufficient in law to maintain the said issue on the part of the plaintiff, and that it, the said defendant, is not bound by the law of the land to answer the same; wherefore, for want of sufficient matter in that behalf to the said jury shown in evidence, the said defendant prays judgment, and that the jury aforesaid may be discharged from giving any verdict upon the said issue, and that the said plaintiff may be barred from having or maintaining her aforesaid action against it, and for grounds of its said demurrer to the evidence, the defendant states in writing the following:

(1) That the said evidence does not show that the defendant was guilty of any negligence which was the cause of this accident.

(2) That it appears from the evidence that the said defendant discharged its duty to the plaintiff's intestate by turning over to him a locomotive engine and boiler and appurtenances in proper condition and safe to operate, in the service to which the same was put.

(3) That the evidence shows that the explosion which resulted

in the injury and death of the plaintiff's intestate was caused by low water due to the sole negligence of the plaintiff's intestate.

(4) That the evidence shows that if said explosion was not caused by law water, that it was due to the sole negligence of the plaintiff's intestate in his failure to perform his duty of properly inspecting said boiler.

(5) That if the evidence fails to show that the accident which resulted in the injury and death of the plaintiff's — was not due to the sole negligence of the plaintiffs intestate, as above specified, that it necessarily shows that the injury was the result of an accident which was unforeseen and could not be guarded against and which was ordinarily incident to the employment of the plaintiff's intestate, or of which he knew, or should have known, the risk of danger from which he assumed.

G. A. WINGFIELD,
HALL, WOODS & COXE,
*Attorneys for Defendant.*

*Joinder in Demurrer to Evidence.*

In the Circuit Court of Roanoke County, Virginia.

MAUDE L. ANDREWS, Adm'r'x of A. W. Andrews, Deceased,

**v.**

VIRGINIAN RAILWAY COMPANY.

Joinder in Demurrer to Evidence.

And the plaintiff says that the matters aforesaid, to the jurors in form aforesaid, shown in evidence, are sufficient in law to maintain the issue joined on the part of the plaintiff.

Wherefore, forasmuch as the said defendant has given no answer to the same, the said plaintiff demands that the defendant be convicted, that the jury be required to assess her damages and that judgment in her favor against the said defendant be entered thereon.

MAUDE L. ANDREWS,
*Administratrix of A. W. Andrews, Deceased,*
By Counsel, —— ——.

A. B. HUNT,
A. P. STAPLES,
*Counsel.*

*Bills of Exception.*

MAUDE L. ANDREWS, Administratrix of A. W. Andrews, Deceased,

vs.

THE VIRGINIAN RAILWAY COMPANY.

*Bill of Exception No.* 1.

Be it remembered that upon the trial of this case the plaintiff, to maintain the issue on her part, introduced the witness L. S. RANDOLPH, whose testimony is set forth at large in the demurrer to the evidence in this case, which is hereby referred to as a part hereof; and after the witness had testified he was asked the following questions:

"Q. I wish you would explain to the jury the method of seating those bolts, which have resulted in their being cracked by tight pressure in screwing them up to the crown-sheet?"

To which question the defendant objected but the Court overruled the said objection and allowed the witness to answer the question as follows,—

"A. You see your screwing them here, you have got the pressure of the thread there (indicating) one way, and the underside of this head here, just like any ordinary bolt, and you screw it down like this, and it tightens it and puts the strain on the bolt, and that strain comes between that point there, its maximum is there, between that point and the head. That is always very great, and the practice is a little different, as well as I can get at it, some relying on the fit of the thread there to keep the leakage, others on this pressure right around in here, to fit there. Sometimes, and this looks as if it had been intended, a copper wire or something is put around in that groove to stop the leakage. Now under those circumstances, that puts a heavy strain way out to this edge here, then if there is any distortion, that puts it still greater, and a comparatively light degree of heat may have caused that to break in there. Now, in regard to that, one curious thing that occurs in regard to iron and steel both, and I could best describe it by an experiment which was made, and where I first saw it. A piece of steel, used for boilers, and I have seen the same thing occur with iron, this piece of steel was about that long and about that wide (indicating) and possibly three-eight-s or half an inch thick, it was heated on one end and turned over and folded down flat heated to more than bright red, almost white heat, the other end was cold, turned over and folded down, cold in between, it was heated to a black heat, what we call black heat, and the slightest attempt to bend that cracked it, so that at black heat, both iron and steel are likely to crack. The steady straight-way pull on it does not always show it up, but it is brittle when cold or when quite hot, and would take an amount of movement in there that it would not when black hot, say just under a

dark red. We do not know exactly what that temperature is, I have never found it, but somewhere about that temperature. Now, that would cause that to break off, even when that thread there is usually considered strong enough, if it fits well to hold the load."

Plaintiff then asked the witness the following question:

"Q. You mean, if I understand you, and I don't know whether I got that very clear or not, that when this is screwed up very tight against the crown-sheet, and a bad fit is made of it, if the sheet is heated to a cherry red temperature, the expansion of the crown-sheet causes that to creak off?"

The defendant objected to said question but the Court overruled the said objection and allowed the question to be answered as follows:

"A. Yes, sir; it will cause it to crack right down there, and furthermore, of course, if it bears unevenly on one side or the other the strain is entirely put on one *said* and that makes it crack."

The plaintiff then asked witness the following question:

"Q. And some of those bolts, as I understand you to say, might be completely cracked off and drop down into the fire?"

To which question the defendant objected, but the Court overruled said objection and permitted the question to be answered, as follows:

"A. Yes, sir."

The plaintiff then asked the witness the following question:

"Q. Is that illustrated in the difference between these two bolts, one of which was produced here, not having been in the fire, and this other one here, as to the different method produced that way?"

To which question the defendant by counsel objected, but the Court overruled said objection and permitted the question to be answered as follows:

"A. I do not see very much difference in those, except the one that was not in the boiler has a little blue scale on it yet."

To which ruling of the Court, in permitting the witness to answer the said questions, the defendant by counsel excepted, and tenders this, its Bill of Exceptions No. 1, which is signed, sealed and made a part of the record this 20th day of June, 1916.

W. W. MOFFETT, *Judge.*

MAUDE L. ANDREWS, Administratrix of A. W. Andrews, Deceased,

vs.

THE VIRGINIAN RAILWAY COMPANY.

*Bill of Exception No. 2.*

Be it remembered that upon the trial of this case the plaintiff, to maintain the issue on her part, introduced the witness L. S. RAN-

DOLPH, whose testimony is set forth at large in the demurrer to the evidence, in this case, which is hereby referred to as a part hereof. And after the witness had testified that the stay bolts looked as if they had been twisted off, the plaintiff by counsel asked the witness the following question:

"Q. Now, if the size of this wrench head which is on the bolt head, is larger than the strength of the thread; in other words, is so large that it will not give way before the threads are stripped, and that is screwed in that way, would it have a tendency to weaken the head of the bolt or injure it or not?"

To which question the defendant objected, but the Court overruled the said objection and allowed the witness to answer the question, as follows:

"A. It would have a tendency to weaken the head of the bolt;"—

To which ruling of the Court, in permitting the witness to answer said question, the defendant by counsel excepted, and tenders this, its Bill of Exceptions No. 2, which is signed, sealed and made a part of the record, this 20th day of June, 1916.

W. W. MOFFETT, *Judge*.

MAUDE L. ANDREWS, Administratrix of A. W. Andrews, Deceased,

vs.

THE VIRGINIAN RAILWAY COMPANY.

*Bill of Exceptions No. 3.*

Be it remembered that upon the trial of this case, the plaintiff, to maintain the issue on her part, introduced the witness ARTHUR SCRIVENOR, whose testimony is set forth at large in the demurrer to the evidence, which is hereby referred to as a part hereof, and who testified as follows, with reference to his qualifications as an expert;

"Direct examination.

By Mr. Staples:

Q. What is your business?

A. An Engineer.

Q. Tell the jury what experience you have had, what line of work you have been engaged in that brings you in touch with locomotive boilers and kindred questions?

A. When I first left school I went to the Barrow Hematite Steam and Iron Works in Lancashire, England, where I was employed in firing boilers and gas producers. From there I went to North Greenwich where they had an experimental station, firing boilers with coal and with oil, they had about seven or eight boilers there, and from there I went to the Unity Iron Works, and from there I came to this country and I was employed at the American Locomotive Works, then the Richmond Locomotive Works, in the draw-

ing offices, and in 1893 I went into business for myself doing engineering work, and for several years I have been occupied in what is called power plant work, familiar with the stationary boilers particularly, and had a good deal to do with boilers and engines, electrical apparatus and things of that kind. In that time I had charge of manufacturing plants, foundry work and machine shops and so forth.

Q. Have you examined the cross-sheet over there in this case?

A. Yes, sir.

By Mr. Hall: I do not think witness has qualified as an expert on locomotive boilers and I would like to ask him a few questions along that line.

By the Court: Very well.

By Mr. Hall:

Q. What experience have you had with locomotive boilers, Mr. Scrivenor?

A. You mean in running locomotive boilers?

Q. No, I mean in knowing anything about them.

A. Only while I was in the locomotive works and what I have seen with my eyes at other times since, and what I have read about them.

Q. You were a draftsman in the office of the locomotive works?

A. Yes, sir.

Q. You had nothing to do with the construction of boilers?

A. Except to go to the shops and see how things were carried out and that they were carried out.

Q. To see that they were constructed according to the plans you drew?

A. Yes, sir; I mean going in and getting the details, and I was brought in touch with the work going on in the shops. I do not mean to say we were put in the place of the foreman, because we were not.

Q. You had nothing to do with the construction of boilers, actual boiler work?

A. No, sir.

Q. You had nothing to do with the running of locomotive engines or repairing locomotive engines?

A. No, sir.

Q. And your experience in connection with locomotive engines ended in 1893?

A. Any practical experience that I had with them; yes, sir.

Q. How long were you in the drafting room in the Richmond Locomotive Works?

A. From December, 1891, until they closed in 1893; I have forgotten the month.

By Mr. Hall: That is all I desire to ask the witness, but we think the witness is clearly incompetent to testify as to locomotive boilers.

By Mr. Staples: We think he is qualified to speak as to that.

By Mr. Staples:

Q. I will ask you whether or not in your work in the Locomotive Works at Richmond, you were necessarily brought in contact with the actual manufacture and building of boilers?

A. Yes, sir, I saw them built every day I was there.

By Mr. Hall:

Q. What kind of locomotives were being built in 1893?

A. You mean what types?

Q. Yes.

A. They were older types than are built today.

Q. They were entirely different types of engine?

A. Very much different. The first radial stay fire box, I think, was built at the Richmond Locomotive Works while I was there, and it was designed by the master mechanic of the C. & O. Railroad.

Q. And the types of locomotive engine in their size and kind of crown-sheets and stay-bolts have entirely changed since 1893?

A. I do not think the kind of crown-sheet and the kind of stay-bolts have changed very much since the radial stays and radial crown-sheets were started, but I think the type of locomotive has changed a great deal.

By Mr. Staples:

Q. Mr. Scrivenor, did the work that you have done require knowledge of the principles which would be applicable in determining from an inspection of a crown-sheet of an exploded locomotive, a failed crown-sheet, as to the cause of the failure?

Defendant objected.

By the Court: Ask him what experience he has had to enable him to determine that.

Defendant excepted.

A. Ask that question again please.

(The question is read to the witness).

A. You use the word "require," I can not say my work has required that knowledge, but one acquires that knowledge by pursuing that work.

Q. Do you think you are familiar with those principles of mechanical physics which would be involved in determining that?

A. I think so.

By the Court: Go ahead.

Q. Mr. Scrivenor, have you examined the crown-sheet in this case, lying over there in view of the jury?

A. Yes, sir.

By the Court: I suppose it is admitted that is the crown-sheet?

By Mr. Hall: Yes, sir, that is the crown-sheet.

By Mr. Staples: The defendant produced this crown-sheet as the crown-sheet that was blown down when the explosion occurred and when Mr. Andrews was killed.

By Mr. Hall: We object, if your Honor please, to the witness

answering any question with reference to this crown-sheet as an expert witness, on the ground that he has not shown himself qualified to answer as an expert witness.

By the Court: That is to save marking any exceptions hereafter?

By Mr. Hall: Yes, sir.

By the Court: Just note the objection, and objection overruled.

By Mr. Hall: I want to ask one question. Have you ever examined a crown-sheet of a locomotive that failed from low water?

Witness: No, sir.

By Mr. Hall: Did you ever see one in your life before you saw this crown-sheet that had failed and was buckled down as this crown-sheet is?

Witness: I didn't catch that, please read it.

(Question read to witness).

A. Not unless I saw it on a scrap heap. I mean I may have seen one but I can not say definitely at any particular place that I did see one.

Q. You can not say definitely that you ever saw a crown sheet in your life that was blown out on account of low water?

A. I can not say it was blown out on account of low water.

Q. Can you say that you ever saw a crown-sheet blown out in any way in an explosion of an engine?

A. I did not see the explosion, but I have seen damaged engines and damaged fire boxes.

Q. I asked you about locomotive engines.

A. I am speaking of locomotives.

Q. You do not know whether any of them were damaged by an explosion caused by low water or not?

A. No, sir.

By Mr. Hunt: Mr. Hall has assumed as a matter of fact this one has, and I submit that it is not proper.

By the Court: Go ahead.

By Mr. Hall: We want to renew our objection to the witness being allowed to testify as an expert as to this crown-sheet.

By the Court: Unless you have some other objection, this one exception can be to all of this evidence along this line.

Defendant excepted.

By Mr. Staples:

Q. Has your experience made you familiar—that is, your experience and study, made you familiar—with the effect upon iron of heat; that is, the effect upon its holding power, and the effect upon its appearance?

A. I have had considerable experience from its appearance.

Q. Have you made any considerable study of the effect of heat upon its holding power?

A. To some extent.

And the defendant, thereupon, by counsel, objected to the said witness being allowed to testify as an expert witness, but the Court overruled said objections, and allowed the witness to testify, which

evidence is fully set forth in demurrer to the evidence, to which reference is hereby specifically made; to which rulings of the Court in permitting the said witness to testify, as an expert witness as set forth in the demurrer to the evidence, the defendant, by counsel, exceped and tenders this its Bill of Exceptions No. 3, which is signed, scealed and made a part of the record this 20th day of June, 1916.

W. W. MOFFETT, *Judge.*

MAUDE L. ANDREWS, Administratrix of A. W. Andrews, Deceased,

vs.

THE VIRGINIAN RAILWAY COMPANY.

*Bill of Exceptions No.* 4.

Be it remembered that upon the trial of this cause, the plaintiff, to maintain the issue on her part, introduced the witness L. S. Randolph, whose testimony is set forth at large in the demurrer to the evidence, which is hereby referred to as a part hereof, who was permitted to testify, over the objection of the defendant's counsel, as follows:

"Q. If the water glass was in good, perfect condition at the time it was turned over to the engineer at Roanoke, could it has been possible for scale to have been deposited on it in such a way as to cause it to register erroneous an hour or so later?

A. You will have to define what you mean by scale, the question as stated there seems to indicate that you mean lime salts, which are deposited from the water. I do not see how it would be possible for those lime salts to close up that gauge in an hour or so, if it had been in anywhere near its proper condition when it left Roanoke."

To which ruling of the Court in permitting the witness to so testify, the defendant, by counsel, excepted, and tenders this its Bill of Exceptions No. 4, which is signed, sealed and made a part of the record, this 20th day of June, 1916.

W. W. MOFFETT, *Judge.*

MAUDE L. ANDREWS, Administratrix of A. W. Andrews, Deceased,

v.

THE VIRGINIAN RAILWAY COMPANY.

*Bill of Exceptions No.* 5.

Be it remembered that upon the trial of this case, the defendant, to maintain the issue on its part, introduced the witness A. H. McGhee, whose testimony is set forth at large in the demurrer to the evidence, which is hereby referred to as a part hereof, and after the witness had testified that he had made an inspection of engine No. 469 as required by the Boiler Inspection Law, and had made a

sworn report to the U. S. Government as required by said act, the plaintiff's counsel was permitted, over the objection of the defendant, to cross-examine the witness as follows:

"Q. I will change the form of the question. Did you make a report on engine No. 473 just before its crown-sheet had trouble?

A. When 473 came in there, the night man, he got the engine and then it went to the back shop, and I inspected it there, but I do not know the date.

Q. You still haven't answered my question. I asked you if you made a report of engine 473 just before, not after this trouble, but before it had trouble with its crown-sheet, the same kind of report that you sent in on 469?

A. Yes, sir.

Q. You reported that in good fix, didn't you?

A. Yes, sir.

Q. When, as a matter of fact, there was stuff on the crown-sheet, wasn't there?

A. Let me understand you.

Q. After you made this report on engine 473, after you made the report, it developed that there was stuff, filings and scrapings, etc. on the crown-sheet of engine 473, wasn't there?

A. Yes, sir.

Q. While its crown-sheet was in that condition, your report was with the Government showing everything O. K., wasn't it?

A. Yes, sir; I think it was, I inspected it."

To which ruling of the Court in permitting the witness to be cross-examined, as above set forth, the defendant, by counsel, excepted, and tendered this its Bill of Exceptions No. 5, which is signed, sealed and made a part of the record, this 20th day of June, 1916.

W. W. MOFFETT, *Judge.*

*Judge's Certificate of Evidence Offered, but Not Admitted.*

In the Circuit Court of Roanoke County, Virginia.

MAUDE L. ANDREWS, Adm'r'x,

v.

VIRGINIAN RAILWAY COMPANY.

Judge's Certificate of Evidence Offered, but Not Admitted.

I, W. W. Moffett, Judge of the Circuit Court of Roanoke County, Virginia, do hereby certify that on the second trial of the case of Maude L. Andrews, adm'r'x, v. Virginian Railway Company, the plaintiff, to maintain the issue on her part, offered to introduce the same evidence which she introduced on the first trial of said case, the same being set forth and contained in the printed record of said case which was used in the proceedings whereby a former judgment in

favor of the plaintiff was reviewed on writ of error and reversed by the Supreme Court of Appeals of Virginia; a copy of which said record was filed with defendant's demurrer to the evidence, and marked "Exhibit Record," and that all the said evidence so offered to be introduced at said second trial was introduced and admitted as evidence in the case, except that excluded upon motion of the defendant, which excluded part is as follows:

(1) Witness, JERRE WALTON. From pp. 51, 52 and 53 of said record:

"Q. Tell the jury whether or not that crown-sheet was heated to a red hot heat at the time of this accident?

A. No sir, I cannot say.

Q. Mr. Walton, if a crown-sheet is heated to a red heat will it make any different light in the fire box than when not heated—the difference between a blue and red appearance, I mean?

Defendant objected.

By the Court: You may ask him about the general effect, not at this particular time, but the general effect of overheating.

Defendant excepted.

A. I never did see one heated.

By the Court: You are talking about the under side of that crown-sheet?

By Mr. Staples: Which is the top of the fire box.

Q. How is that fire box made with reference to the crown-sheet, describe that to the jury?

A. I don't know as I could do that.

Q. The best you can; I do not ask you to draw an accurate drawing of it.

A. How the fire box is made?

By Mr. Hunt, continuing:

Q. I will ask you this question: Was the crown sheet of that boiler so much within the range of your vision in firing the boiler that if it had been heated to a red heat that you would have been bound to have noticed it?

Q. Do you understand the question?

A. I couldn't say positively on that.

Q. Give us your best judgment on that?

Q. What do you say to that?

A. I suppose you would.

By Mr. Hall: He answered that question once.

By the Court: He said 'I could not say,' and then a direct question was repeated to him, and he now says he supposes he could.'

By Mr. Hall: Well, we object to it.

Objection overruled. Defendant excepted.

A. You never gave me time to answer that question.

By Mr. Hall: Wait a minute until the court makes a ruling.
By the Court: Go ahead. Do you want to say anything further, Mr. Walton? You started to say something; go ahead and say it if you want to answer it.

A. I started to make an answer a little while ago and then you all objected to it and I never answered the question.

By the Court: When either side objects you just stop talking.
Witness: Yes, sir; I do.
By Mr. Hunt: And after the court rules on it, then you can go on and finish your answer if the court says so.

Q. Now, then, to clarify the record upon this point, do I understand you to say that if the crown-sheet had been heated to a red heat it was so within your range of vision while firing the engine, that you think you would have been bound to have seen it?
A. Yes, sir."

(2) Witness, ARTHUR SCRIVENOR, from page 89 of said record:

"Q. How hot could the sheet have been and retain its present appearance?
A. I couldn't say definitely, as I have no records of my own covering that point.
Q. From your study of the subject?
A. I will state that I have read in 'Treatise on Heat' and such things that I should say a Fahrenheit heat from 1,000 to 1,200 degrees."

From page 105 of said record:

"Q. I wish you would state what effect is sometimes produced upon the bolts of a crown-sheet by the fireman opening the box or opening the door and allowing cold drafts to go in?
A. The expansion of the fire box is due to heat, and if cold air is allowed to strike upon the crown-sheet of any kind of a boiler, it must contract it, if it changes its temperature at all; that subjects the bolt to unequal strain and sudden strain sometimes, and it weakens the bolt in some cases and in some cases it breaks them. In case cold air strikes it, it causes a sudden contraction, an unequal contraction of the sheet, which has been previously heated."

(3) Witness, L. S. RANDOLPH. From page 114 of said Record:

"Q. You do not think that would have affected it?
A. I can not imagine how it would have affected it.
Q. But you think mud or oil might cause it, without the absence of water from the sheet?
A. It might cause it."

From pages 122-123 of said Record:

"Q. I want you to eliminate from your answer the detailing of any experiments which you have made, just give conclusions which you have applicable to this crown-sheet, and if you think you are

qualified to state to the jury the effect of the angle between those sheets upon this crown-sheet in question, the effect upon those bolt heads of the change in the angle between the sheets in this boiler, then you can answer it, otherwise you can not.

Defendant objected. Sustained. Exception.

By the Court: If you can answer that question from your own learning on the subject, you can answer it.

By Mr. Staples: As well as from his experiments?

By the Court: I said from his learning on the particular subject, you can answer it.

A. Include everything?

By the Court: What does learning mean, from your learning on the subject?

Defendant excepts.

A. I think it would have a slight effect on those bolt heads.

Q. State whether or not the change of the relative positions of those two sheets would probably weaken the bolts or bold heads along the top of the whole crown-sheet?

A. It would tend to weaken it; I do not think the motion at the head in the crown-sheet on account of the length of the stays would be sufficient to injure the bolts very seriously unless the engine was running a long time."

From pages 124-125 of said Record.

"Q. Now, as to the button head bolts, is there a liability to injury when they are screwed into the fire box where the holes are not tapped at right angles to the sheet and where the surface of the sheet is curved?

By Mr. Hall: We object to the question, to the substance of the question and not to the form.

A. If your Honor please, I want to change that question a little bit. The tapping—there are two holes to be considered in order to make it clear to the jury, the tapping of one hole at right angles to the sheet, whether that hole is tapped at right angles to the sheet does not matter so very much, but tapping or having both holes punched so that when the stay is put in the heads will come out and bear evenly all around the sheet. Now, if it is not put in so, one side of the head may bear hard and the other side not at all, and then when you screw it up tightly it will tend to crack the head off.

Q. It is, or not, in your opinion, necessary practice in building locomotives to use a seating tool which faces off the inside of the sheet exactly at right angles to the longitudinal axis of the bolts.

By Mr. Hall: We object to the substance of the question.

A. I think it is advisable, though if care is taken in seating those holes I do not think it necessary; or if a washer is used under the head, it would not be necessary."

And I do further certify that the defendant offered to introduce all of the testimony which it introduced on the first trial of this case, as set forth in said printed record from page 157 to 518, and that all of said testimony was admitted in evidence on the second trial.

Given under my hand and seal this 16th day of June, 1916.

[SEAL.] W. W. MOFFETT, *Judge.*

And, at another day, to-wit:

At a Circuit Court Continued and Held in and for the County of Roanoke, at the Courthouse Thereof, on the 16th Day of June, 1916.

MAUDE L. ANDREWS, Adm'x,

vs.

VIRGINIAN RAILWAY COMPANY.

This day came the parties by their attorneys, and by consent of parties the demurrer to the fourth count of Plaintiff's declaration was sustained, and the defendant Company, for plea, says it is not guilty in manner and form as against it in said declaration is alleged, and of this it puts itself upon the Country, and the plaintiff doth the like.

And thereupon came a jury, to-wit: C. H. Grove, C. O. Murray, C. B. Strickler, R. N. Betson, W. G. Baer, J. S. Perrow, A. G. Brown who were elected, tried and sworn, the truth to speak upon the issue joined between the plaintiff and the defendant, and having heard the evidence and the instruction of the Court and argument of counsel, and the defendant having interposed its demurrer to the evidence in which the plaintiff joined, the jury retired to their room to consider of their verdict, and after some time returned into Court, and presented the following verdict:

"We, the jury find for the plaintiff and assess her damages at the sum of $20,000.00, and apportion the same as follows:

| | |
|---|---|
| To Maude L. Andrews (widow) | $4,000.00 |
| To Arthur W. Andrews (child) | 4,000.00 |
| To Martha J. Andrews (child) | 4,000.00 |
| To Peyton C. Andrews (child) | 4,000.00 |
| To Macon C. Andrews (child) | 4,000.00 |

Subject to the opinion of the Court on the defendant's demurrer to the evidence.

C. B. STRICKLER, *Foreman.*"

And thereupon, the Court doth sustain the defendant's demurrer to the evidence, and it is ordered that the plaintiff, Maude L. Andrews Administratrix of A. W. Andrews, deceased, take and recover nothing of the defendant, the Virginian Railway Company, under

and by her pleadings and action in this behalf, that the verdict of the Jury in favor of the plaintiff, subject to the opinion of this Court on the demurrer to the evidence, be set aside, that the said defendant be hence dismissed, and that said defendant have and recover of and from the said plaintiff, de bonis testatoris, its proper costs expended by it in this trial, to which ruling and judgment the plaintiff excepts.

The plaintiff having indicated her intention to apply to the Supreme Court of Appeals of Virginia for a writ of error to this judgment, on her motion, it is ordered that this judgment be suspended for sixty days from the rising of this Court.

MEMO.—The Plaintiff and defendant this day each excepted to sundry rulings of the Court.

*Opinion of the Court.*

Reasons for giving judgment against the plaintiff on the demurrer to the evidence—

Because the evidence is the same as that introduced at the first trial upon which the jury returned a verdict for the plaintiff, upon which verdict this Court rendered judgment in favor of the plaintiff. The Supreme Court of Appeals of Virginia reversed the said judgment of this court and in its opinion said that the evidence was insufficient to support the judgment of this Court. Under the well established rule, this thereupon became the law of the case, so far as this Court is concerned and is conclusive and binding.

Judgment is therefore given for the defendant against the plaintiff.

W. W. MOFFETT, *Judge.*

In the Circuit Court for the County of Roanoke, Virginia.

MAUDE L. ANDREWS, Administratrix — A. W. Andrews, Deceased,

vs.

VIRGINIAN RAILWAY COMPANY, a Corporation.

*Petition for Writ of Error and Supersedeas.*

Your petitioner, Maude L. Andrews, Administratrix of A. W. Andrews, deceased, conceiving herself aggrieved by the final decision of the Circuit Court of Roanoke County, Virginia, rendering a judgment against her in the above entitled action on June 16, 1916, in favor of the defendant, in that action, Virginian Railway Company, a corporation, adjudging that your petitioner take nothing by virtue of her pleadings and action and adjudging costs to the said defendant against your petitioner, obtained from the Clerk of the said Circuit Court of Roanoke County, Virginia, a complete

transcript of the Record in said cause, duly certified, and presented the same, together with her petition and assignment of errors, praying for the allowance of a writ of error and supersedeas, by the Supreme Court of Appeals of Virginia, to the said judgment of said Circuit Court of Roanoke County, Virginia, and all of the Judges of the said Supreme Court of Appeals of Virginia, in vacation, refused to award to your petitioner the said Writ of Error and Supersedeas prayed for on September 29, 1916; and thereafter, towit: on the 13th day of November, 1916, your petitioner again presented her said petition for writ of error together with certified copy of the transcript of the record in said proceedings to the said Supreme Court of Appeals of Virginia, in open Court while the said Court was sitting in term at Richmond, Virginia, and the said Court on the said 13th day of November, 1916, made a final order refusing to your petitioner a Writ of Error and Supersedeas prayed for by her and declining to take jurisdiction of this cause; a duly certified copy of which order of the Supreme Court of Appeals of Virginia is herewith filed marked Exhibit A and is prayed to be read as a part of this petition.

The said order of the Supreme Court of Appeals of Virginia refusing to take jurisdiction of this case is a final order, and now comes your petitioner, Maude L. Matthews, Administratrix of A. W. Andrews, deceased, plaintiff in error, who was the plaintiff in said Circuit Court of Roanoke County, Virginia, and prays a Writ of Error from said decision and judgment of the Circuit Court of Roanoke County, Virginia, to the Supreme Court of the United States, the said Circuit Court of Roanoke County, Virginia, being the highest court of law or equity in said state in which a judgment can be had in said case. And your petitioner prays that said judgment of the said Circuit Court of Roanoke County, Virginia, entered on June 16, 1916, may be reviewed and reversed, and that judgment may be rendered in favor of your petitioner upon the verdict of the Jury, awarding her damages as shown by the Record in this cause; and your petitioner hereto attaches and files as a part of this petition, her assignment of errors.

MAUDE L. ANDREWS,
*Administratrix of A. W. Andrews, Deceased.*
By W. L. WELBORN,
*Her Counsel.*

W. L. WELBORN.
A. B. HUNT,
A. P. STAPLES,
*Counsel for Petitioner.*

Writ of Error is hereby allowed as prayed by the Petitioner, Maude L. Andrews, Administratrix of A. W. Andrews, deceased, Let Writ of Error issue upon the execution of a bond by Maude L. Andrews, Administratrix of A. W. Andrews, deceased, or someone for her, to the defendant, Virginian Railway Com-

pany, in the sum of One Hundred ($100.00), Dollars the said bond not to operate as a Supersedeas.

Nov. 27 1916.

W. W. MOFFETT,
*Presiding and Only Judge of the Circuit Court of Roanoke County, Virginia.*

VIRGINIA:

In the Supreme Court of Appeals, Held at the Library Building, in the City of Richmond on Monday, the 13th Day of November, 1916.

This day came Maude L. Andrews, Administratrix of A. W. Andrews, deceased, by counsel, and presented her petition in open court for a writ of error and supersedeas to a final judgment of the Circuit Court of Roanoke County, Virginia, entered on the 16th day of June, 1916, against her in favor of the Virginian Railway Company in an action then therein depending wherein the said petitioner was plaintiff and the Virginian Railway Company was defendant, and it appearing to the court that the said petition was presented to the Judges of this Court, in vacation, and the same was maturely considered and the transcript of the record seen and inspected and that on the 29th day of September, 1916, a writ of error was refused by all of the Judges of this Court, and that said action was plainly right, the Court doth refuse said writ of error and decline to take jurisdiction of the case.

A copy,
Teste:

H. STEWART JONES, *C. C.*

Exhibit "A" With Petition for Writ of Error.

**In the Circuit Court of Roanoke County, Virginia.**

MAUDE L. ANDREWS, Administratrix — A. W. ANDREWS, Deceased.

**vs.**

VIRGINIAN RAILWAY COMPANY, a Corporation.

*Assignment of Errors.*

Maude L. Andrews, Administratrix of A. W. Andrews, deceased, Plaintiff in error, comes and files herewith her petition praying for writ of error, and says that there are errors in the record and proceedings of the above entitled cause, lately depending in the Circuit Court of Roanoke County, Virginia, wherein your petitioner was the sole plaintiff and the Virginian Railway Company, a corporation, was the sole defendant, and makes the following assignment of errors.

I. The Circuit Court of Roanoke County, Virginia, erred in sustaining the defendant's demurrer to the evidence, setting aside the verdict of the jury in favor of the plaintiff and entering final judgment in favor of the defendant, and in not overruling said demurrer to the evidence and in not entering judgment in favor of the plaintiff for the amount of damages assessed to her by the said verdict of the jury.

The said plaintiff, as will appear from the transcript of the record and proceedings in this case, asserted the right to recover damages of the defendant under and by virtue of the provisions of two certain acts of Congress the first approved April 22, 1908, known as the Federal Employers' liability Act (35 U. S. Stat. at L. 65, c. 149) and the other approved Feb. 17, 1911, known as the Federal Safe Boiler Act (36 Stat. 913). The said plaintiff, therefore, claimed in this case rights, privileges, and immunities under the Statutes and Laws of the United States, which were denied by the said decision and judgment.

The said errors in the said judgment are more particularly set forth as follows: that is to say, the said Circuit Court erred in sustaining the said demurrer to the evidence and entering judgment for defendant and in not entering judgment for the plaintiff, for the following reasons:

(*a*) The evidence was sufficient to justify the jury in finding that when the locomotive engine No. 469 was delivered to plaintiff's intestate at Roanoke on the night of the injury, the stay bolts and crown sheet of the boiler were not in proper condition and safe to operate in the service of drawing the freight train to which it was attached and that said condition was the proximate cause, or one of the proximate causes, of the death of plaintiff's intestate.

(*b*) The evidence was sufficient to justify the jury in finding that when the locomotive engine No. 469, was delivered to plaintiff's intestate at Roanoke on the night of the injury, the water glass, an appurtenance of the boiler of said locomotive, was not in proper condition and safe to operate in the service of registering the quantity of water in the boiler of said locomotive, while drawing the freight train aforesaid, and that said condition of said water glass was the proximate cause, or one of the proximate causes, of the death of plaintiff's intestate.

(*c*) The evidence as to the circumstances under which the explosion occurred was sufficient to bring the case within the influence of the maxim, res ipsa loquitur, and justified an inference that the death of the plaintiff's intestate resulted wholly or in part from an explosion of the locomotive boiler due to an unsafe water glass, or to unsafe staybolts or unsafe crown bolts or unsafe crown sheet, or a combination of two or more of said causes, and that said unsafe condition of said water glass or stay bolts, or crown sheet, or crown bolts, or of two or more of them, was due to the defendant's violation of the duties imposed upon it under the Federal Safe Boiler Statute (36 Stat. 913) to have the said boiler and appurtenances thereof, of the locomotive No. 469 in proper condition and safe to operate

in the service of pulling the freight train it was then engaged in pulling.

(*d*) The proper construction of the Federal Safe Boiler Statute (36 Stat. 913) renders the defendant liable for an injury resulting from any improper or unsafe condition of the glass water gauge, an appurtenance of the boiler, whether said unsafe or improper condition comes into existence in transit during the run or whether same existed before the commencement of the run, and the evidence justified a finding, on the part of the jury, that the death of plaintiff's intestate was caused either wholly or in part, by unsafe staybolts or crown sheet or unsafe water glass.

For which errors, the plaintiff, Maude L. Andrews, Administratrix of A. W. Andrews, deceased, prays:

1. That the said judgment entered by the said Circuit Court of Roanoke County, Virginia, against her on the 16th day of June, 1916, as aforesaid, may be reviewed, reversed and annulled;

2. That a judgment may be rendered in this court in favor of the plaintiff for the damages awarded to her by the verdict of the jury, to-wit: the sum of twenty thousand dollars with interest thereon from the 16th day of June, 1916, and for costs.

3. That all such other and further and more general and complete relief as may be proper in the premises may be granted to her.

And your petitioner will every pray, etc.,

W. L. WELBORN,
A. B. HUNT,
ABRAM P. STAPLES,
*Attorneys for the Plaintiff, Maude L. Andrews, Adm'x of A. W. Andrews, Deceased.*

Identified as Assignment of Errors with Petition for Writ of Error Received and filed this 27th day of November, 1916.

CHAS. D. DENIT, *Clerk.*

In the Circuit Court for the County of Roanoke, Virginia.

MAUDE L. ANDREWS, Administratrix — A. W. Andrews, Deceased,
Plaintiff,

vs.

VIRGINIAN RAILWAY COMPANY, a Corporation, Defendant.

*Bond to Cover Costs.*

Know All Men by These Presents, that we, Maude L. Andrews, Administratrix of A. W. Andrews, deceased, as principal, and D. W. Peisinger and J. F. Smith, as surety, are held and firmly bound unto the Virginian Railway Company, a corporation, in the sum of One Hundred dollars, to which payment, well and truly to be made, we bind ourselves, jointly and severally, firmly by these presents.

Sealed with our seals this 28th day of November, 1916.

Whereas, Maude L. Andrews, Administratrix, of A. W. Andrews, deceased, plaintiff in error in a cause lately depending in the Circuit Court of Roanoke County, Virginia, wherein Maude L. Andrews, was plaintiff and Virginian Railway Company, a corporation, was defendant, seeks to prosecute her writ of error to the Supreme Court of the United States to reverse the judgment rendered on June 16, 1916, against her in said cause by the Circuit Court of Roanoke County, Virginia.

Now, Therefore, the condition of this obligation is such that if the said Maude L. Andrews, Administratrix of A. W. Andrews, deceased, plaintiff in error as aforesaid, shall prosecute her said writ of error to effect, and answer all costs which may be attached, if she shall fail to make good her plea, then this obligation to be void, otherwise to remain in full force and virtue.

MAUDE L. ANDREWS. [SEAL.]
*Administratrix of A. W. Andrews, Deceased.*
J. F. SMITH, [SEAL.]
D. W. PEISINGER. [SEAL.]

The foregoing bond is hereby approved.

W. W. MOFFETT,
*Presiding and Only Judge of the Circuit Court of Roanoke County, Va.*

The original of the foregoing bond was lodged with the Clerk of the Circuit Court of Roanoke County, Virginia, on the 1st day of December, 1916, and the following endorsement made thereon: "Bond received and filed, December 1st, 1916.

Teste: CHAS. D. DENIT,
*Clerk Circuit Court of Roanoke County, Va.*"

*Citation.*

THE UNITED STATES OF AMERICA, *ss:*

The President of the United States to Virginian Railway Company, Greeting:

You are hereby cited and admonished to be and appear at and before the Supreme Court of the United States at Washington, D. C., within thirty days from the date hereof, pursuant to a writ of error filed in the office of the Clerk of the Circuit Court for Roanoke County, Virginia, wherein you are defendant in error and Maude L. Andrews, Administratrix of A. W. Andrews, deceased, is plaintiff in error, to show cause, if any there be, why the judgment rendered against the said plaintiff in error as in said writ of error mentioned, should not be corrected, and why speedy justice should not be done the parties in that behalf.

Witness the presiding and only Judge of the Circuit Court of Roanoke County, Virginia, this 29th day of November 1916.

W. W. MOFFETT,
*Presiding and Only Judge of the Circuit Court of Roanoke County, Virginia.*

Legal service of the above citation is hereby acknowledged.

VIRGINIAN RAILWAY COMPANY,
By H. T. HALL, *Counsel.*

November 29th, 1916.

UNITED STATES OF AMERICA, *ss.*:

The President of the United States of America to the Circuit Court of the County of Roanoke, Virginia, Greeting:

Because in the record and proceedings, as also in the rendition of the judgment, of a plea which is in the said Circuit Court of the County of Roanoke, Virginia, before you, being the highest Court of law or equity of the said State in which a decision could be had in the said suit between Maude L. Andrews, Administratrix of A. W. Andrews, deceased, Plaintiff in error, and Virginian Railway Company, a Corporation, Defendant in Error, wher-in was drawn in question the validity of a treaty or statute of, or an authority exercised under, the United States, and the decision was against their validity; or wherein was drawn in question the validity of a statute of, or an authority exercised under, said State, on the ground of their being repugnant to the Constitution, treaties or laws, of the United States, and the decision was in favor of such, their validity; or wherein was drawn in question the construction of a clause of the Constitution, or of a treaty, or statute of, or commission held under, the United States, and the decision was against the title, privilege, or exemption specially set up or claimed under such clause of the said Constitution, treaty, statute, or commission, a manifest error hath happened, to the great damage of the said Maude L. Andrews, Administratrix of A. W. Andrews, deceased, as by her complaint appears, we being willing that error, if any hath been, should be duly corrected, and full and speedy justice done to the parties aforesaid in this behalf, do command you, if judgment be therein given, that then under your seal, distinctly and openly you send the record and proceedings aforesaid, with all things concerning the same, to the Supreme Court of the United States, together with this writ, so that you have the same in the said Supreme Court at the City of Washington, District of Columbia, on the 18th day of December, 1916, to be then and there held, that the record and proceedings aforesaid being inspected, the said Supreme Court may cause further to be done therein, to correct that error, what of right and according to the laws and customs of the United States should be done.

Witness, the Honorable Edward D. White, Chief Justice of the

said Supreme Court, the 4th day of December, in the year of our Lord, one thousand nine hundred and sixteen.

S. W. MARTIN,
*Clerk of the United States District Court for the Western District of Virginia.*
By FRANK J. HALL,
*Deputy Clerk at Roanoke, Va.*

[Seal of the United States District Court for the Western District of Virginia.]

Allowed by:
W. W. MOFFETT,
*Presiding and Only Judge of the Circuit Court of the County of Roanoke, Virginia.*

The foregoing original writ of error was lodged with the Clerk of the Circuit Court of Roanoke County, Virginia, on the 5th day of December, 1916, and also at the same time and place a copy thereof was lodged in the said Clerk's Office for the Virginian Railway Company, a Corporation, defendant in error.

The following endorsement was made upon said original writ of error and upon each of said copies thereof:

"Writ of Error filed December 5th, 1916.

CHAS. D. DENIT,
*Clerk of the Circuit Court of Roanoke County Virginia.*"

Attest:
CHAS. D. DENIT,
*Clerk of the Circuit Court of Roanoke County, Virginia.*

STATE OF VIRGINIA,
*County of Roanoke, to-wit:*

I, Chas. D. Denit, Clerk of the Circuit Court of Roanoke County, Virginia, do hereby certify that the foregoing is a true transcript of the record in the case of Maude L. Andrews, — deceased, versus Virginian Railway Company, a corporation, and that the writings annexed to this certificate are true copies of the originals on file and of record in my office, and that said originals, together, constitute the record of proceeding of said Court in this cause.

Witness my hand and the seal of the said Court this 5th day of December, 1916.

[Seal, Circuit Court, Roanoke County, Virginia.]

CHAS. D. DENIT, *Clerk.*

STATE OF VIRGINIA,
*County of Roanoke, to-wit:*

I, W. W. Moffett, Presiding and Only Judge of the Circuit Court of the county of Roanoke, State of Virginia, do hereby certify that

Chas. D. Denit, whose name is signed to the foregoing certificate, is and was at the time of signing the same, Clerk of said Court, duly qualified; that his attestation is in due form of law; that his signature is genuine, and that all his official acts are entitled to full faith and credit.

Given under my hand and seal this 5th day of December, 1916.

[SEAL.] W. W. MOFFETT,
*Presiding and Only Judge of the Circuit Court of Roanoke County, Virginia.*

STATE OF VIRGINIA,
*County of Roanoke, To-wit:*

I, Chas. D. Denit, Clerk of the said Circuit Court of the County of Roanoke, State of Virginia, do hereby certify that Honorable W. W. Moffett, whose genuine signature is subscribed to the foregoing certificate, is and was at the time of signing and attesting same, Presiding and Only Judge of the Circuit Court of the County of Roanoke, State of Virginia, duly commissioned and qualified.

Witness my hand and the seal of said Court this 5th day of December, 1916.

[Seal Circuit Court, Roanoke County Virginia.]

CHAS. D. DENIT, *Clerk.*

Endorsed on cover: File No. 25,646. Virginia Roanoke County Circuit Court. Term No. 816. Maude L. Andrews, Administratrix of A. W. Andrews, deceased, plaintiff in error, vs. Virginian Railway Company. Filed December 13th, 1916. File No. 25,646.

# Supreme Court of the United States

## OCTOBER TERM, 1918

No. 82

MAUDE L. ANDREWS, ADMINISTRATRIX
of A. W. ANDREWS, *Deceased*,
*Plaintiff in Error*

*VS.*

VIRGINIAN RAILWAY COMPANY,
*Defendant in Error.*

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## REPLY BRIEF OF COUNSEL FOR PLAINTIFF IN ERROR.

Our original brief, after discussing the construction of the Boiler Act, sets out three grounds of recovery upon which the plaintiff relies: First, that the explosion of the boiler under circumstances where the water glass showed that there was an abundant supply of water in the boiler permits an inference that either the boiler or the water glass, one on the other, was unsafe; Second, that the testimony of *plaintiff's* expert witnesses that the explosion was not caused by low water but by defective bolts and bolt heads, corroborated as it was by the testimony of the fireman that there was ample water in the boiler at the time of the explosion permits an inference that the *boiler* was unsafe; and Third, that the testimony of the fireman that the water glass indicated water in the boiler, taken in connection with the evidence introduced by *defendant* in seeking to prove that the explosion was caused by an absence of water, permits an inference that the *water glass* was unsafe.

If any one of our arguments upon these points cannot be successfully answered, then the plaintiff's right to recover unquestionably follows. If they can be, the reverse is equally true. These three propositions go to the very heart of this case. They cannot be evaded, if the case is to be decided upon its merits. There either is, or there is not, sufficient evidence to sustain them, or one of them. If there is, a reversal of the judgment for the defendant is imperative; if there is not, that judgment must be affirmed.

Under this situation we had the right to expect that, for the sake of clearness of discussion, the opposing brief would join issue with us upon the propositions announced. But a reading of the defendant's brief renders it obvious that if there is anything our adversaries do *not* desire, it is to have to face a clear cut issue involving the real merits of this case. They begin, at the outset, with the vague charge that our statements of what the evidence proves are not borne out by the testimony of the witnesses, when considered as a whole; that in referring to pages of the record we refer to isolated answers which are essentially different from the substance of what the witnesses say. Vague accusations of this kind are easy to make, but contain nothing sufficiently tangible to answer. The statements of the evidence contained in our brief are absolutely accurate, so far as extreme care in their preparation has enabled us to make them so. We do not claim infallibility, however, nor that our vision is not affected by zeal for the interests of our client; but realizing that overstatement or exaggeration is more harmful than otherwise in a court of justice, we endeavored to be guided by this principle, and to state only what we felt convinced the record clearly substantiated. Suffice it to say that adversary counsel, with all their industry, have not discovered a single specific instance in our statement of the evidence which, even from their opposite view point, they regarded as containing error of sufficient importance to bring to the Court's attention.

The greater part of the defendant's argument we anticipated and a sufficient reply thereto is contained in our original brief. Such reply as we propose to make here will be considered under the following divisions or heads:

I. (a) The defendants contention that this case does not involve any question of the proper construction of the Boiler Act; the construction placed upon said act by the Court of Appeals below; and the straw man contained in the opposing argument on the construction of the Statute; and, (b) the construction placed upon said act by this Court in the recent case of *Great Northern Ry. Company v Donaldson*, decided since our original brief was filed.

II. The alleged "findings of fact" by the Appellate Court below and their alleged conclusive effect upon this Court; and the effect here of the difference in opinion between the Trial Court and the Appellate Court below upon the question of the sufficiency of the evidence to sustain the plaintiff's verdict.

III. (a) The defendant's contentions upon the interpretation of the testimony of the plaintiff's witnesses and the weight same is entitled to receive; and (b) the alleged inadmissibility of said testimony.

IV. The defendant's contention that the evidence conclusively establishes low water as the cause of the explosion.

V. The defendant's contention that the testimony of its witnesses that they performed *their* duty of inspecting the boiler and water glass conclusively establishes that the boiler and water glass were in safe and proper condition within the meaning of the Boiler Act.

VI. The admission of the defendant that the testimony of the fireman permits an inference that the water glass was unsafe, and its contention that not-

withstanding same the plaintiff's intestate was guilty of negligence which was *in law* the sole cause of the explosion.

We will now proceed to discuss these subjects in the order designated.

I. (a) THE DEFENDANT'S CONTENTION THAT THIS CASE DOES NOT INVOLVE ANY QUESTION OF THE PROPER CONSTRUCTION OF THE BOILER ACT, THE CONSTRUCTION PLACED UPON SAID ACT BY THE COURT OF APPEALS BELOW, AND THE STRAW MAN IN THE OPPOSING ARGUMENT ON THE CONSTRUCTION OF THE STATUTE.

Adversary counsel contend that the present case does not involve the interpretation of the Federal Boiler Act, but simply has to do with an appreciation of all the facts and admissible inferences for the purpose of determining the sufficiency of the evidence to go to the jury. But the duty owing from the defendant to the plaintiff must necessarily be clearly determined before it can be said whether the evidence justifies a finding that said duty has been violated. Thus, in the case of *Patton v Texas & P. R. Co., 179 U. S. 658*, this court held the rule of *res ipsa loquitur* did not apply to an action to recover for injuries to an employe occasioned by a defective instrumentality, because the circumstances attending the happening of that accident did not permit an inference that the railroad had been wanting in ordinary care in inspecting and repairing same. On the other hand, in the case of *Minneapolis etc., R. Co., v Gotschall, 244 U. S. 66*, which was to recover for injuries to an employee caused by being thrown from the top of a moving train when the cars separated on account of the opening of a coupler, the jury, under an instruction of the court, was permitted to infer a breach of the railroad's duty from the *mere fact that the coupler failed to perform its function*, there being no other proof as to the condition of the coupler. This court, in holding the doctrines of *res ipsa loquitur* applicable to the case, said that the rule announced in the Patton case

was not controlling "*in view of the positive duty imposed by the statute upon the railroad to furnish safe appliances for the coupling of cars.*"

In the case at bar, we earnestly submit, the absolute duty on the part of the railroad to have the boiler and water glass in safe condition, and the abolition of the defenses of contributory negligence and assumption of risk, bring the present case within the ruling of the Gotschall case, and if the evidence as to the circumstances surrounding the explosion is such as to permit the inference that said explosion was actually caused, in part, by an unsafe boiler or an unsafe water glass then the rule *res ipsa loquitur* is applicable.

The case of *Marcean v Rutland R. Co., 211 N. Y. 203*, is so apposite upon this point that we wish to direct the attention of the Court to it. There it was held that the peculiar facts and circumstances surrounding the explosion of the locomotive boiler permitted the application of the doctrine of *res ipsa loquitur* in an action by the employee to recover for personal injury. The court said, however, that the engine, being in the custody and control of the plaintiff and his engineer, this rendered it necessary for the plaintiff to supplement the proof of the mere happening of the accident with other circumstantial evidence excluding his own fault as the cause of the explosion. The same principle is applicable in the case at bar.

Our Opponents contend that the Court of Appeals below construed the boiler act in the case at bar upon the same principles that this Court has applied in cases under the other safety appliance acts. But not only does the opinion below *expressly state* that the same principles are *not* applicable, but it also expressly holds that the testimony of defendant's employees that they performed *their* duty of inspecting the boiler and water glass, establishes *as a matter of law*, that the railroad has discharged *its* duties under the boiler act; and furthermore, said opinion below expressly affirms that the defendant's duty is discharged by *turning over to the employee at the beginning of the trip*, an engine with boiler

and appurtenances which have been properly inspected and no defect discovered. Such a construction of the act fails to consider one of the cardinal purposes of these statutes as repeatedly laid down in the decisions of this Court, which has been declared to be to transfer from the employee the burden of losses due to such accidents from defective appliances and place it upon the carrier as a part of the industrial risk.

As a matter of fact, the decision of this case turns wholly upon the construction of the statute. There is little or no conflict in any of the testimony except that of the expert witnesses; and the testimony of the fireman Jerry Walton necessitates the conclusion that either the water glass was unsafe or else the boiler was unsafe. The only question is whether the Court of Appeals was correct when it held that the railroad "discharged its statutory duty to the engineer *by turning over to him*" an engine the boiler and appurtenances of which the company's employees testified they had inspected without discovering any defect, or whether as held by this court in the Gotschall case, the jury should be "permitted to infer negligence on the part of the company from the fact that the" boiler or water glass, one or the other, "*failed to perform its function*". In addition to this, the plaintiff's case is strengthened by the testimony of her expert witnesses that the stay bolt heads showed they had been previously broken and that the appearance of the crown sheet indicated that there was water in the boiler when the explosion occurred.

Opposing counsel have been extremely agile in evading any argument upon the question whether evidence of the explosion of the boiler under circumstances where the water glass indicated water in the boiler would permit recovery under the principles applied in the Gotschall case. The only argument contained in their entire brief upon the construction of the Boiler Act is a *pretended* one on pages 8-10 inclusive. Let us refer to it and see if it meets fairly in the face the question here presented.

Their argument takes the form of answering a contention we are said to have made in our original brief. We quote from page 8 of their brief, where they say:

> "The plaintiff's contention is that under a proper construction of the boiler act, *the mere fact of an explosion* is sufficient for the inference to result that there was a defect in violation of the act."

And the entire argument on the construction of the act is devoted to answering this supposed contention of ours.

But what justification or excuse is there for imputing the above contention to us? Undoubtedly we have not made any such argument in our brief filed in this Court, as we now take the pains to demonstrate by quoting from it at page 47 where we said:

> "However the locomotive, being in charge of the engineer and requiring attention from him to prevent an explosion, even when in proper condition, *evidence of the mere fact of an explosion while in charge of the engineer would seem not to be sufficient to prove a violation of the duty imposed by the statute for his protection*, but the evidence must show that the explosion occurred under such circumstances as that it would not have occurred if the boiler and appurtenances had been safe."

And on page 40 of our brief we said:

> "But the fact that the boiler requires attention by the engineer to prevent its exploding is a good and sufficient reason why evidence of the mere fact that it did explode while in his charge should not be sufficient, in and of itself, to prove that the statute has been violated, for, *in the absence of evidence as to the circumstances attending the explosion*, it may perhaps

be as probable that the accident occurred through his lack of attention as that it occurred from an unsafe appliance."

Thus, not only once, but *twice*, in our brief, we expressly, clearly and unequivocally stated that our views are directly the opposite of those opposing counsel impute to us. It is equally as clear from an inspection of the pleadings and the conduct of the trial that we made no such contention in the courts below.

What a complete confession of weakness is this attempt to becloud the issue, this "answer to the wrong point." Instead of replying to our argument that recovery may be sustained by evidence of the explosion of the boiler *under circumstances where the water glass indicated ample water over the crown sheet*, they boldly set up this straw man and vigorously proceed to demolish it. In lieu of combating our proposition that the Boiler Act fixes liability upon the Railroad for the death of this man if it resulted in part from a defective boiler or water glass, even though the defect was not discoverable by inspection, or came into existence in transit, they *invent* something to argue about, which no one has ever disputed and which no lawyer ever would dispute.

In reality, the principles laid down in the decisions of this Court, cited in our original brief, are so clearly and firmly expressed in said decisions that our opponents have been compelled to concede to our contentions as to the construction of the Boiler Act. The admission, however, is sought to be concealed in the attack upon the straw man above shown, and is couched in such language as to give the impression that those views have been entertained by them all along, and that we are combating them. Suffice it to say, however, that they admit that in cases under the act a breach of the duty thereby imposed may "be inferred from the happening of an accident," where there is "shown by the evidence such a condition of affairs that the accident, according to the ordinary experience of mankind,

*might* have been caused by the failure of the defendant to perform some legal duty." (Pages 9-10).

Who will dispute the proposition that if a boiler exploded at a time when the water glass indicated that it was nearly full of water, the explosion "might have been caused" by an unsafe boiler or an unsafe water glass?

This brings us to the consideration of a recent decision of this Court construing this very act.

(b) THE CONSTRUCTION PLACED UPON THE BOILER ACT BY THIS COURT IN THE RECENT CASE OF GREAT NORTHERN RAILWAY COMPANY *v* DONALDSON, 246, U. S. 121.

The opinion in the above case was published in the advance sheets of the Supreme Court Reporter after our original brief had been filed. We have before us the record and briefs of counsel, and the various contentions advanced by the respective parties and the testimony introduced in support of them bear such striking resemblance to the case at bar that we feel that it will be of assistance to the Court in disposing of the present case, to refresh their memory upon the issues and questions there involved.

The action was to recover for the death of a locomotive engineer who was killed by the explosion of the boiler upon the locomotive he was at the time in charge of operating. The plaintiff sought to recover upon three theories set out in her complaint: (1) That the stay bolt heads were too large for an oil burning engine and became hot and gave way when there was ample water in the boiler; (2) That the railroad had allowed scale to accumulate inside the boiler which had caused the crown sheet and bolt heads to become hot and give way when there was water in the boiler; and (3) That if the explosion was caused by absence of water from the sheet, the defendant was liable because of its failure to have a fusible plug installed in the crown sheet, which, it was claimed, would melt in the event of low water, and notify the engineer of the danger. The plaintiff

claimed that the boiler was unsafe in these three respects and that said unsafeness was a violation of the Boiler Act.

The instructions of the trial court told the jury that if the boiler was unsafe in any of the respects mentioned in the complaint it constituted a violation of the duties prescribed by the Boiler Act. The Supreme Court of the State of Washington having affirmed the judgment for the plaintiff, the case was brought to this Court by writ of error. The contention of the railroad made here upon the construction of the statute was that if the unsafeness of the boiler was due to the type or design of construction, that is—to the use of the large bolt heads or want of use of a fusible plug in the crown sheet—this did not amount to a violation of the act, as the provisions of the Act only made it mandatory upon the railroad to have and maintain the type of boiler it had adopted in safe and proper condition; that the question of what type or design of construction was to be used was for the Federal Boiler inspectors to prescribe, and as they had not disapproved of the large button head bolts or of the failure to use a fusible plug in the crown sheet, the use of the one or non-use of the other could not amount to a violation of the act. Counsel for the railroad, in their arguments to sustain their view of this statute, frequently quoted from the opinion of the Court of Appeals of Virginia in the present case, showing that the Virginia Court had taken the same view they contended for. But this Court declined to accede to their arguments, holding on ths contrary, that in view of the requirements of Section two of the Boiler Act, the fact that the boiler was unsafe amounted to a violation of the statute.

Points of striking similarity in the evidence adduced by the railroad companies in the Donaldson case and in the case at bar respectively, will be hereafter noticed in discussing the subjects heretofore outlined under the Fourth Head.

We will now take up the question most emphasized in the opposing brief.

## II. The Alleged "Findings of Fact" by the Appellate Court Below and Their Alleged Conclusive Effect Upon This Court, and the Effect Here of the Difference in Opinion Between the Trial Court and the State Appellate Court Upon the Question of the Sufficiency of the Evidence.

The brief of defendant in error in reality is devoted, not so much to the merits or demerits of this case, as it is devoted to an effort to impress the seal of finality upon the opinion of the Court of Appeals of Virginia reversing plaintiff's judgment on the first trial, and, by constant and repeated references to and restatements of said opinion, to draw attention from the real question here involved. Expressions contained in said opinion, our opponents time and again refer to as "findings of fact", behind which, they contend, this court cannot go. Indeed, the whole case has been approached by them, not from the standpoint of whether there was enough evidence to carry the question of recovery to the jury, *but from the standpoint of whether the Railway Company produced enough evidence to sustain these alleged "findings of fact,"* which are claimed to be found in the opinion rendered *on a former trial* by the Virginia Appellate Court.

The error of this position of our opponents—that the Virginia Court of Appeals has "found the facts" and that unless there is a palpable failure of evidence to support said "findings of fact" there can be no reversal—clearly appears from a number of recent decisions of this court. In the first place no "*questions of fact*" were before the Virginia Appellate Court. On the contrary every issue of fact had been resolved in favor of plaintiff in error by the verdict of the jury. The entire decision in the State Appellate Court depended upon the *legal question* whether, conceding the utmost probative value to the plaintiff's evidence, there was enough to sustain the jury's verdict. This *question of law* the trial court had decided in favor of the plaintiff by refusing to set aside the verdict, though under the prac-

tice in Virginia the trial court is allowed much greater latitude in disturbing the verdict of a jury than the Court of Appeals.

As we have said, repeated decisions of this Court demonstrate the error of this contention of the Railway Company, but we need refer to only two of them.

The recent case of *Union Pacific Railroad Company v Huxoll, 245 U. S. 535*, involved liability under the Federal Employers Liability Act and Safety Appliance Act relating to power brakes, for the death of a locomotive engineer. The Supreme Court of Nebraska having affirmed a judgment in favor of the plaintiff the case was brought here by writ of error. The following excerpt from the opinion applies to the point here under discussion:

> "The oral argument of counsel for the plaintiff in error was practically confined to the proposition that the trial court committed reversible error in submitting these questions to the jury, for the reason that even if it be assumed, (as it must be, for there is sharp conflict on the point), that the power brake was not in working order, there was no substantial evidence in the case that this failure contributed, in whole or in part, to cause the death of Huxoll. * * * *It is necessary for us to examine the evidence in the record* to determine the validity of this claim, for the reason that *it presents a federal question, not of fact, but of law.* (Creswell v Knights of Pythias, 225 U. S. 246; Seaboard Air Line v Padgett, 236 U. S. 668)".

An earlier case, that of *North Carolina R. Co., v Zachary, 232 U. S. 248*, which was an action for the death of a locomotive engineer, is even more closely akin to the case at bar. The right of recovery there was materially affected by the question whether the decedent, at the time he was killed, was engaged in in-

terstate commerce. The railroad requested instructions submitting this question to the jury, but they were refused by the trial court, and their refusal approved by the Supreme Court of the State *upon the ground that the evidence showed the fact to be that the decedent was not engaged in interstate commerce.* After referring to the questions raised, the opinion of this Court goes on to say:

> "*It was, however, held by the Supreme Court of North Carolina that deceased, at the time he was killed, was not in fact employed by the Southern Railway, the lessee, in interstate commerce.* There are several grounds upon which this decision was based, or upon which it is said to be supportable, and these will be separately noticed. Of course, *if upon the evidence any essential matter of fact was in doubt, it should have been submitted to the jury* under proper instructions. The rulings of the trial court deprived plaintiff in error of the opportunity to go to the jury upon the question. But it is now insisted that there was *no evidence* tending to show that deceased was engaged in interstate commerce. *This renders it incumbent upon us to analyze the evidence* to the extent necessary to give to plaintiff in error the benefit of its asserted federal right. Southern Pac. Co., v Schuyler 227 U. S. 601, and cases cited."

After proceeding to discuss the evidence, the opinion continues:

> "We conclude with respect to the facts necessary to bring the case within the federal act, that *there was evidence that at least was sufficient to go to the jury.* It is doubtful whether there was substantial contradiction respecting any of these facts; *but this we need not consider.*"

Thus in the above case, what opposing counsel would term the "findings of fact" by both State Courts, was reviewed by this Court, the evidence was analyzed and the case reversed upon the ground that "there was evidence that at least was sufficient to go to the jury."

Therefore, plainly the question now before this court is *not*, as our opponents contend, whether the record discloses sufficient evidence to support the alleged "findings of fact" by the Court of Appeals, but the question here is the legal one whether there was any evidence tending to support the federal right asserted by the *plaintiff* and the verdict of the jury in her favor.

A further effort to avoid a too careful scrutiny of the evidence by this Court is found in the Railway Company's contention that it comes here with the favorable action of the trial court, concurred in by the Court of Appeals. Under the practice followed in *Myers v Pittsburg Coal Company, 233 U. S. 184*, where the judgment of the trial court entered upon the jury's verdict for the plaintiff was reversed by the Circuit Court of Appeals for absence of testimony to sustain it, this court examined the evidence, unprejudiced by the judgment of the Circuit Court of Appeals; and if there was a division of opinion between the courts below in the case at bar, the same practice applies here by virtue of Section 237 of the Judicial Code, which provides that the writ of error from this Court to a *State* Court "shall have the same effect as if the judgment or decree complained of had been rendered or passed in a Court of the United States."

The railroad's contention that this case is to be considered here upon the assumption that it has secured the favorable action of the trial court, concurred in by the Supreme Court of Appeals of Virginia, is obviously wrong. On the first trial the jury found in favor of the plaintiff, and the learned Circuit Judge overruled defendant's motion to set aside the verdict as contrary to the law and the evidence, but entered judgment thereon. The evidence, *as contained in the record before this court,*

was certified to the Supreme Court of Appeals of Virginia and reviewed under section 3484 of the Va. Code, which provides that:

> *"When a case at law, civil or criminal is tried by a jury, and a party excepts to the judgment or action of the Court in granting or refusing to grant a new trial on a motion to set aside the verdict of a jury on the ground that it is contrary to the evidence, and the evidence, (not the facts), is certified, the rule of decision in the Appellate Court in considering the evidence in the case shall be as on a demurrer to the evidence by the appellant."*

The Court of Appeals said that it was of opinion that the evidence, "viewed from the standpoint of a demurrer to the evidence" was insufficient to support the judgment of the Circuit Court and the verdict of jury, and therefore reversed said judgment, set aside said verdict and remanded the case for a new trial.

Of course this was not a final judgment to which a writ of error from the Supreme Court of the United States would lie, and in order to have this court review this *question of law*, (sufficiency of the evidence), it was necessary to go through the form of a new trial at which the same evidence was introduced and a demurrer thereto interposed by the railroad. The decision of the Court of Appeals upon the question of law raised by this demurrer having become the law of the case, the hands of the Circuit Court were tied. It could not exercise any independent judgment in the matter but must, per-force, follow the mandate of the Court of Appeals, which it did, sustaining defendant's demurrer. But this judgment was not yet that of the highest court of the state in which a judgment could be had, such as might be brought up under Section 237 of the Judicial Code. (*Cox v. Armour, 237 U. S. 413*). Therefore the plaintiff had to go through the form of having the Court of Appeals, in term time, refuse a writ of error to again review the very question it had already

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decided, and which was as conclusively *res judicata* there as it had been in the Circuit Court. Of course this writ of error was refused as a matter of form.

By virtue of these proceedings, *formal only*, though necessary to bring the case here, the railroad claims to have the *favorable concurrent opinion* of the state courts, trial and appellate, upon the legal question of whether there is any evidence of plaintiff's federal right here asserted. To sustain this contention would be to follow the shadow and ignore the substance of what has been done, or to borrow an expression of Judge Taft in *Taylor v. Louisville and Nashville Railroad Co., 31 C. C. A. 537*, "It is to stick in the bark and to be blind to the substance of things. It is to sacrifice justice to its incident."

It is also said by our opponents that certain evidence was excluded on the second trial which was admitted on the first, and this rendered the question presented on the demurrer to the evidence at the second trial essentially different from that on the first and therefore that it will be presumed that in sustaining this demurrer the trial court was not merely following the mandate of the Court of Appeals but was exercising its independent judgment. Did the trial court, however, regard the evidence which it rejected, (which obviously has no bearing upon the real questions in the case), as presenting a different question? On the contrary, *the trial court's opinion says: "Because the evidence is the same* * * * * * this thereupon became the law of the case, so far as this Court is concerned, and is conclusive and binding."

Opposing counsel contend that the opinion of the Court of Appeals on the first trial contains "findings of fact," and that these "findings of fact" conclude the case, yet they also contend that the Circuit Court exercised independent judgment in sustaining the demurrer to the evidence on the *second trial*, after these alleged "findings of fact" had been made. It is difficult to reconcile these two positions, both of which are untenable; the first, because the Court of

Appeals decided only the *legal* question of whether there was *any* evidence of the federal right asserted; and the second, because this legal question so decided was the same legal question which the demurrer to the evidence raised for the Circuit Court on the second trial, and, the evidence being the same, said question had become *res judicata*.

Because opposing counsel, however, have laid such great stress upon the opinion of the State Appellate Court and have so persistently invoked it as a reason why this court should not make more than a mere perfunctory examination of the evidence, we feel it our duty to endeavor to offset that contention by emphasizing a number of important mistakes which occur in the recitals of the evidence as contained in the opinion of the Court of Appeals in this case. This we do with the utmost respect for the Appellate Court below, for which we entertain sentiments of the highest regard and deference, and it would be a source of deep regret to us if we thought that anything in this brief could be construed in any sense as a criticism or reflection, either upon the ability of that Court, or the care and consideration which this case has received at its hands. We are convinced that the reason the Court did not, in its recitals of the testimony, adhere to the rules applicable for considering testimony upon a demurrer to the evidence, is because, under its construction of the Boiler Act, it did not consider that the ultimate question of the right of recovery was affected, one way or another, by the circumstantial evidence, even conceding these circumstances to be as plaintiff claimed. Not finding what it considered sufficient evidence to establish the existence of a specific defect in the boiler or appurtenances *when the engine was delivered at the beginning of the trip*, this ended the case with the court below, as we view its opinion; and its recitals of the evidence, which the Court will observe, are recitals of the *defendant's* evidence almost exclusively, are wholly *obiter dicta* under the Court of Appeal's construction of the Boiler Act.

This is our view of the opinion below. If we are wrong, and if the writer of that opinion did intend it as an analysis of the entire testimony of both sides, subjecting same to the stringent rules adverse to the Railway Company which a demurrer to the evidence compels, we can only say that 'tis human to err, and we are convinced that error has been committed, otherwise we would not have brought the case here.

As stated, opposing counsel are endeavoring to use said opinion against us in their effort to induce this Court to shut its eyes to the real evidence before it. In other words the very identical erroneous conclusions of the Court of Appeals which this writ of error is designed to have reviewed here are made the basis of nearly the entire argument in support of the defendant's effort to have said erroneous conclusion affirmed.

We therefore respectfully submit that the recitals of the evidence contained in the opinion of the Court of Appeals below are obviously not intended to be accurate, but are in fact erroneous, and are not supported by the record, in the following particulars:

1. The opinion says, "On Nov. 11, 1912, three days prior to the accident, it, (the boiler) was inspected by *government inspectors under the act of Congress.*"

But the record shows that the inspection referred to was not conducted by a *government* inspector but was claimed to have been made by defendant's employee, Funk, who said he had not even served his boilermaker apprenticeship and did not claim to be an expert.

2. The opinion says, with respect to the testimony of the fireman, Walton: "This witness admittedly had no familiarity with that type of engine, *that being his first trip on an engine of that class;* and not to mention distractions incident to the discharge of his duties as fireman, *his only opportunity for acquiring information concerning the engine, boiler and appurtenances covered an hour in time and eighteen miles in distance.*"

But the record shows that the witness had been fireman eighteen months and that as to his previous experience *on this class of engine* his testimony was as follows:

Q. Had you fired for other engineers *on the same class and kind of engine that this was?*

A. Yes sir.

Q. Will you tell the Court and jury how many injectors they worked on their runs?

A. Just one is all I ever knowed *on that class of engine.*

(See Record Page 54)

3. The opinion says: "Walton also testified that the injector was working properly and supplying water to the boiler, basing his opinion on the sound it gave forth; *yet he admitted he was without experience as to injectors of that sort.*" But the italicized portion of the above quotation is not only not borne out by the witness's testimony but on the contrary he said he did know how to operate the injector, but had forgotten, and he steadfastly and repeatedly maintained that he could *easily* tell by the sound whether the injector in question was working properly, and his description of the characteristic sounds of said injector, when working properly and when not so working, was corroborated by the testimony of a number of other witnesses as shown in our former brief, pages 53-55 inclusive.

4. After referring to the alleged inspection of the crown sheet on November 11, 1912, and the subsequent alleged inspections of the two hostlers and plaintiff's decedent, which consisted of their merely standing in the cab and looking through the firebox door at the crown sheet, the opinion goes on the say: "It thus appears from the undisputed evidence that at 9:30 P. M.

the time of departure for Princeton, just one hour before the explosion, the defendant had complied with every requirement of the boiler act, and the locomotive engine, boiler and appurtenances measured up to statutory standard."

Thus, merely from evidence of these perfunctory inspections, which the evidence shows would not have revealed the defective condition of the stay bolts, the Court of Appeals has drawn the conclusion, *as a matter of law*, that the crown sheet, stay bolts and water glass were actually in proper condition and safe to operate within the meaning of the boiler act. This is clearly erroneous as we have shown from a consideration of the evidence and from the decisions of this court, in our former brief, pages 56-64 inclusive, and as appears from the decision in Great Northern Ry. Co. v Donaldson, supra.

5. After referring to the testimony given by plaintiff's expert witnesses to the effect that an examination of the crown sheet and stay bolts of the exploded locomotive led them to the opinion that the crown sheet had been overheated on some occasion prior to the explosion, the opinion says: "*But these theories were refuted by the positive evidence that the crown sheet had not previously been burned, and that there was no oil or other foreign substance in the boiler at the time of failure.*" This is also clearly a mistake, because the only inspections claimed to have been made of the crown sheet after the inspection on November 11, 1912, consisted of standing in the engine cab and looking through the firebox door at the crown sheet, *while there was a fire in the firebox.* It is quite obvious, as two of defendant's witnesses admitted, that it could not be determined by an inspection of this kind whether the crown sheet had been previously overheated or not. (For references to this testimony see our former brief, Pages 59-61 inclusive). Not a single witness claimed that such an inspection would disclose whether the crown sheet had been previously burned and certainly neither by the inspection of Nov. 11, 1912, nor by those of looking in the firebox door could it possibly

have been ascertained *whether there was scale or oil on the inside of the boiler.* There was absolutely no evidence that the inside of the boiler was free from scale or oil; on the contrary the evidence indicated that the water used in defendant's boilers was very bad and had a strong tendency to form large quantities of mud scale. (Record Pages 359-360.)

The opposing brief lays stress upon the statement of plaintiff's expert witness Randolph that the bagging in the crown sheet between the bolt holes was such as would be revealed by "*inspection.*" With this statement we agree. But neither Randolph nor any other witness said or intimated that this bagging could be discovered by looking through the firebox door when the engine was under fire. This was not the method of inspection Randolph referred to. The inspection which Funk says he made on November 11, 1912, several days before the explosion, to perform which he says he removed all fire from the engine and entered the firebox might, if properly conducted, have revealed the bagged condition, if it then existed, though the record shows that the company's inspector of boilers had previously reported to the Interstate Commerce Commission that the crown sheet of another engine, No. 473, was in good condition, whereas, a day or so later, the crown sheet of said engine was burned, standing in the yards at Princeton, on account of accumulated material inside the boiler which said inspector had failed to discover or report. (Record Pages 218-219).

6. The opinion further says: "As remarked, the engine left Roanoke an hour before the accident in good condition, and there was no evidence of leakage during the short run of 18 miles, *which would necessarily have been the case had the theory of the experts that the crown sheet had been previously burned been correct.*".

This statement is in the very teeth of the undisputed testimony of defendant's own expert witnesses who admitted that a comparatively large number of

engines are at all times in service on nearly every railroad, the crown sheets of which have been previously burned and the engines are not leaking. (See Record, pages 144, 145, 421, 422, 457, 497).

7. The opinion also says that "it was *in evidence*" that if the injector was not working properly, "*the interval of time which elapsed between Singer's Tank and the point of accident was sufficient for the crown sheet to become exposed from lack of water*".

If the Court intended this as an interpretation of the evidence bearing on this issue of fact, it is absolutely wrong and concerns a most vital fact in the case. We have shown in our former brief that the quantity of water in the boiler at Singer not only *could not have been consumed* at the time of the accident but that defendants superintendent of Motive Power, one of its chief witnesses *admitted* that it could not. (See our former brief, Pages 48-52 inclusive).

The opinion entirely ignores all the evidence of the plaintiff on this question, as well as admissions of the defendant's witnesses, and defendant's brief does not even attempt to answer our argument on this point. There was no evidence in the record to the effect that the crown sheet could have become exposed from lack of water in the time indicated.

8. The opinion, referring to plaintiff's expert testimony says, "*the opinions of the witnesses were neither founded upon facts within their own knowledge or established by other evidence in the case*".

It is a fact, and the record so shows, that the crown sheet and twelve of the bolt heads from the exploded locomotive *were in court*, were examined by plaintiff's witnesses, the trial court and the jury, and that *the testimony of plaintiff's experts was based upon their personal inspection and examination of said sheet and bolts*, and rested upon the same foundation as the testimony of defendant's expert witnesses.

9. The opinion mentions the fact that the engine was *operated* by Andrews exclusively after the inspection of Nov. 11, but *fails to consider* the further fact that fully *half the time* thereafter, until the explosion, said engine was in charge of defendant's roundhouse employees, and that the crown sheet would perhaps more probably have been overheated while in their charge than while in charge of Andrews, because the engineer has the very strongest motives to watch the engine, his very life being dependent upon his care in so doing, whereas, in the roundhouse, no one remains on the engine, and the evidence is that water has to be replenished numerous times a day in the boilers of engines in the yards or roundhouse. It will be recalled that defendant's hostler, Neece, in explaining why he went outside of his duties in inspecting the crown sheets of engines with a torch, said: "We had had so much trouble with fellows claiming we had burned engines around there, that was the reason I done that". (Record, Page 320).

We wish to call the Court's attention to the fact that the above erroneous recitals of evidence are pointed out in our original Brief, and opposing Counsel could have replied upon the point if they had thought proper. As stated above, we have given here a summary of them for the purpose of demonstrating that the Court of Appeals could not have intended these recitals as an analysis of the evidence under a demurrer or that if it did so intend them, they are clearly, unquestionably and obviously erroneous.

We pass to the next point.

III. (a) DEFENDANT'S CONTENTIONS UPON THE INTERPRETATION OF THE TESTIMONY OF PLAINTIFF'S WITNESSES AND THE WEIGHT SAME IS ENTITLED TO RECEIVE.

The opposing brief contains frequent insinuations and some open attacks upon the credibility and good faith of the plaintiff's witnesses. Our adversaries are

perfectly well aware that the purpose and effect of their demurrer to the evidence was to concede all such questions and remove them from the case, and that matter and argument of this kind is utterly foreign here.

We might safely pass it by as an obviously unworthy effort to implant in the minds of the Court a suspicion that the plaintiff's case is predicated upon false testimony and should be viewed with disfavor. As said, we might safely pass by this feature, but we choose not to do so. The character and trustworthiness of the plaintiff's witnesses are not such as require to be shielded behind any rule of law. This question has been injected into the case, and we propose briefly to answer it.

Professor Randolph is the chief target singled out. Unable to refute his opinion, they attack his good faith. Ripe in years and rich in experience, this is a man to whom the educational authorities of Virginia have thought fit to entrust the education, guidance and training of the young men of that State for a period of over 20 years. Graduating from one of the foremost technical schools in America, the Stevens Institute of Technology, where he became thoroughly grounded in the rudimentary principles of his profession, he proceeded to devote a number of the years of his young manhood to acquiring that practical experience so necessary to a full rounded development. The knowledge of principles thus acquired thereafter became fixed, broadened and enriched in the work of teaching them to others.

Thus he was when he came to testify.

Coming now to the attacks upon his testimony. Professor Randolph testified that the appearance of the crown sheet could not have been as it was at the trial if the explosion had been caused by low water. This testimony, of course goes to the very heart of the case, and is highly important. Now mark the effort to belittle its value. Referring to this testimony, the

opposing brief at Page 21 says: "When asked as to *when* this burning of the crown sheet occurred, he stated that it might have been three or four days, *or it might have been as many seconds before the failure*, that he could not tell", and the Court is cited to Pages 148 and 149 of the Record in support of the above statement. Of course such a statement, if it had been made, would have the effect of rendering the whole testimony of the witness absurd on its face. But a reading of his testimony not only shows that he nowhere made the statement above attributed to him, but that he said nothing even *similar thereto*. What he did say was that the sheet could not have presented the appearance it did unless sufficient time had elapsed since the overheating for the water to get back on the sheet and cool it, and that this would, at the least, require *from a half to three quarters of an hour*. Opposing counsel then proceed to argue from this, that the crown sheet may have become overheated between the time of leaving Roanoke and arriving at Singer Tank but the testimony of the fireman, Walton, that he watched the water glass at short intervals and that it showed a gradual rise of the water level in the boiler all the time after leaving Roanoke, conclusively negatives any such possibility.

We wish to refer the Court to Page 141 of the Record where this witness, after expressing the opinion that some of the bolts failed first and the balance ripped out afterwards, was asked the question "how long was it between the time the first part failed and the whole thing went down"; to this he replied, "It might have been three or four days; it may have been as many seconds; I cannot tell". The effect of this statement is merely, that so far as the evidence before the witness showed, some of the bolts may have broken three or four days before the explosion, or the whole thing may have occurred in three or four seconds. This, however had nothing to do with when the overheating of the crown sheet occurred. He nowhere stated that the

overheating of the crown sheet may have occurred three or four seconds before the explosion.

We will next notice the statement on page 33 of the Railway Company's brief where it is said that Randolph admits that he did not have before him sufficient evidence to check his opinion referring to page 114 of the Record. This is a manifestly incorrect version of what the witness said. Reading his answer as a whole, his statement was that there was not enough of the remnants of the explosion before him, so that he could say, "whether it, (the crown sheet), was more down on one side of the firebox than the other, and therefore, just the location of these bags; it is difficult to say whether they were due to *mud or oil*, or sometime previously, low water". But defendant claims that the evidence shows that the condition referred to was not due to previous low water. It follows, therefore, that if their contentions in this respect were sound, said condition was due to mud or oil. It will be recalled that defendant lost all the broken bolts (except two which were so rusty nothing could be inferred from them,) and 95 per cent of the broken bolt heads. Under these circumstances, its willingness to endeavor to detract from the weight of plaintiff's evidence because of its own failure to produce this additional evidence, cannot be said to come with good grace. There was ample evidence before this witness, however, for him to state positively that the explosion was not caused by low water, and that one-fourth of the particular bolt heads *selected by the defendant* as evidence had been previously broken.

Again at Page 28 of the opposing brief Randolph's statement—that the way certain of the bolt heads were broken down into the heads, and the color of the break, indicated that the break occurred while the metal was hot—is claimed to be inconsistent with his statement that the crown sheet had water on it when it failed. But so far from being inconsistent with his other testimony, the above statement is in complete harmony with the opinion expressed by him that

the crown sheet and bolt heads had been *previously* overheated from low water, scale, mud or oil, *at which time* the expansion of the sheet and bolt heads, and consequent pressure against one another, had resulted in a fracture of some of the bolt *heads*, and the fact that a part of the broken surface of said bolt heads was blue and a part bright, indicated that *the blue part broke at the previous overheating* and the bright part of the break took place when the explosion occurred.

It is also said that plaintiff's witness Randolph did not examine the crown sheet and bolt heads until they were brought into Court at a former trial. Inasmuch as this evidence remained in the *exclusive* possession of the defendant from the time of the accident until produced in Court, it is not difficult to understand why no previous examination had been made.

The attacks upon the credibility of the fireman, Jerry Walton, will next be noticed. On Page 16 of the opposing brief it is said of this witness:

> "The fireman, Jerry Walton, was a very pliable witness and was willing, under the lead of counsel for the plaintiff, to testify to matters necessary to the plaintiff's case, about which he had absolutely no knowledge, as his own testimony shows".

Aside from the fact that this remark is wholly beside the question here, the criticism is manifestly unjust as a reading of the testimony in question will show. Furthermore, as defendant's witness Scott unwillingly admitted, *Jerry Walton had made the statement to him that the boiler was full of water when the explosion occurred, and had made his statement a few minutes after he was blown out of the cab of the engine*, and at a time when he most certainly was *not* "under the lead of counsel for the plaintiff".

It is also claimed that the testimony of Jerry Walton should not be considered because he was not very

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familiar with this type of engine. We have already dealt with this question at length and need add nothing further here. (See our original brief, pages 53-55 inclusive.)

Again it is said that the testimony of this witness as to the registration of the water glass is "uncertain;" that he did not say the water stood *exactly* half an inch from the top, but measured the distance on his finger and then said it was *about* half an inch. This is claimed to be so "uncertain" as to render his testimony worthless. It is difficult to imagine how he could have stated the height of the water in the glass in more accurate terms without actually measuring it with a rule, and if he had claimed to have done that, under the circumstances, counsel might properly assail the improbability of his statement. We submit that his testimony is natural and indicative of the truth.

Upon the question of the interpretation of the evidence it is said that plaintiff's calculations as to the quantity of water in the boiler at Singer Tank are based on the quantity the boiler contained above the point three inches below the top of the crown sheet, and that therefore they are of no value. But it will be observed that these calculations were made, not by the plaintiff's witness, *but by the defendant's Superintendent of Motive Power*, who was one of its principal expert witnesses, who personally examined the remnants of the explosion immediately after it occurred, and his measurements were based upon conditions as he claimed to have found them. The purpose of the calculation was to ascertain how much water the boiler would have had to vaporize in order to reduce the water level to where defendant claimed it stood when the overheating took place, and the defendant itself furnished the figures we have given in our brief.

The further statement is made in the opposing brief that "the difference of an inch or half an inch in the height of water in a water glass, under the varying conditions of operation, as shown by the record, *may* have caused the sheet to have become uncovered."

This statement, we submit is absolutely unsupported by anything in the record. On its face, it is inherently improbable. Besides, the calculations given in our brief are upon the assumption that the water glass registered a *whole* inch from the top at Singer Tank, whereas, Jerry Walton testified it registered a *half inch*. Thus we have allowed a margin of half an inch in the height of the water in the calculations we have given.

We may add here that opposing counsel have been able to offer no reason whatsoever why these calculations are not correct, or should not be accepted as absolutely conclusive.

(b) THE ALLEGED INADMISSIBILITY OF THE TESTIMONY OF THE PLAINTIFF'S WITNESSES.

The opposing brief contains repeated vague references to alleged "improper evidence," without specifying what evidence is claimed to be improper, or for what reason, and contains also the statement that the principal argument of plaintiff in error is based upon evidence which the Court of Appeals held inadmissible. If counsel really thought that the testimony of the fireman, Walton, or of the mechanical engineer, Professor Randolph, was inadmissible under the opinion of the Court of Appeals reversing the *first* judgment, may we ask why they did not object to the introduction of said evidence *at the second trial?* All the evidence *objected to* on the second trial is contained in the record, Pages 592-602, inclusive. All of these objections, except as to the questions and answers contained on Pages 600-602 inclusive, were *overruled* by the Circuit Court, and that ruling is not subject to review here. An examination of this *alleged* improper evidence, (which the court below admitted), shows that none of it has any bearing upon the question befofe this court except the testimony of the expert witness, Scrivenor, whose testimony as a whole was objected to on the alleged ground that he was not qualified to speak as an expert. The Circuit Court, however, properly admitted his testimony and, as re-

marked, that question is not open here. The *only* testimony of the fireman, Walton, which was objected to on the second trial was his statement that if the crown sheet of the boiler had been heated to a bright red heat when he threw coal in the firebox a moment before the explosion, he believed he would have noticed an unusual glow in the firebox. This testimony was excluded by the Circuit Court and we have made no reference to it in our brief. But opposing counsel say that under the holding of the Appellate Court all of Walton's testimony is inadmissible because he was not sufficiently familiar with the engine to testify. If counsel thought that this evidence was inadmissible why, we repeat, was it that no objection was made to its introduction at the trial? The mere fact that the Railway Company has found it necessary to advance here such contentions as the above only serves to emphasize the desperate weakness of its case.

The opinion below speaks for itself and we need say nothing further upon this point.

IV. The Defendant's Contention That the Evidence Conclusively Establishes Low Water as the Cause of the Explosion.

The first portion of the opposing argument upon this point is devoted to an alleged analysis of the testimony of the plaintiff's witnesses and to an attack upon their credibility. So far as their credibility is concerned, we have dealt with that question under the third head, because, as it has been improperly injected into this case and has no bearing upon the question before the Court for decision, it would serve here only to confuse. We have also replied to the contention that the testimony of these witnesses was held inadmissible by the Court of Appeals. Certain parts of their testimony was held improper, but no part of it upon which we have relied in our original brief.

Professor Randolph's testimony, it is asserted, is based solely upon the color of the crown sheet, but we have shown in our original brief that his opinion was

based upon the previously broken bolt heads, the unbroken bolts in the highest part of the crown sheet, the general appearance of the crown sheet and other minor indications, as well as the color of the sheet.

After commenting upon plaintiff's evidence, opposing counsel then proceed to an elaborate exposition upon seven alleged "unanswerable reasons" why the explosion could have been caused only by low water. It would unduly prolong this already lengthy reply to answer them in detail. Professor Randolph's testimony upon direct and cross examination completely refutes them and demonstrates that the conditions which opposing counsel say conclusively show a low water explosion are not in any way inconsistent with the presence of water in the boiler when the explosion occurred. We especially urge the Court to read the testimony of this witness upon this question if they should feel impressed by the opposing argument.

We do not believe, however, that the Court will find any difficulty in disposing of this question, because the identical question was presented and has already been disposed of in the *Donaldson* case, *supra*, (246 U. S. 121).

In the *Donaldson* case the railroad company contended, (as the defendant does here), that the explosion was caused by low water, and that the low water was due solely to the negligence of the engineer, for whose death the action was brought. The evidence of the plaintiff consisted of the testimony of three expert witnesses, who were of opinion that the explosion was not due to low water, but that the bolt heads were too large for an oil burning engine and gave way while there was water in the boiler, and that the overheating which the crown sheet was shown to have undergone may have been caused by an accumulation of scale in the boiler as well as by an absence of water. There was also evidence of the fireman that the water glass showed water in the boiler. The Railway Company, as in the case at bar, introduced a large number of witnesses who expressed the opinion that the explosion was unquestionably caused by low water, but the Supreme Court of Washington took a different view as to the conclusive

effect of this character of evidence from the Court of Appeals of Virginia, agreeing rather with the Circuit Court of Roanoke County on the first trial.

The Supreme Court of Washington said with respect to this feature of the case:

> "The essence of appellant's contention is that the condition of the crown sheet, bolts and flues after the explosion shows conclusively as a scientific fact that the explosion could not have been due to any other cause than low water. Appellant introduced the testimony of over a dozen boiler makers, master mechanics, boiler inspectors and others, all of whom stated positively that the conditions after the explosion conclusively showed low water as the cause. We do not agree, however, that this testimony established undisputed scientific facts. The evidence at best was of a negative character and the statements of the witnesses were their opinions drawn from their previous experiences. Because they had never known the conditions shown here to occur except from a low water explosion, they concluded that they could not result otherwise. On behalf of the respondent one Hanson, fireman on the engine when the explosion occurred, testified positively that the water glass showed sufficient water on the crown sheet to prevent an explosion. An effort was made to impeach this testimony by introducing a statement prepared by the attorneys for appellant and acknowledged as correct by Hanson while he was in the hospital after the explosion. Hanson denied any knowledge of this statement, claiming that he was unconscious for days after the explosion, and had made no such statements at any time. The credibility of his testimony was clearly for the jury. We have, then, the

evidence of the only witness who was in a position to know positively whether there was water in the boiler, to the effect that the water glass indicated sufficient to prevent a low water explosion. Opposed to this is the testimony of a large number of capable experts that the explosion could have been due only to low water. Under such conditions it was clearly competent for the jury to determine that the testimony of Hanson was entitled to greater weight than that of appellant's witnesses. We conclude that on this ground appellant was not entitled to judgment, and that the denial of a new trial was not an abuse of discretion".

We have quoted the foregoing because the question there decided, *and affirmed by this Court*, is the identical question presented by the record in this case, except that instead of the fireman being impeached by contradictory written and alleged oral statements made after the explosion as was *there* the case, *here Walton was corroborated* by the unwilling testimony of one of defendant's witnesses, to the effect that immediately after the explosion Walton told him that the water glass had shown that the boiler was nearly full of water when it exploded. (Record, Page 255).

The opinions expressed by the expert witnesses for the railway company in the Donaldson case were to the effect that the blue color of the crown sheet immediately after the explosion, the quilting or pocketing of said sheet between the bolts, the fact that the threads of the crown sheet bolt holes did not strip when the crown sheet came down, and the general appearance of the fire box, crown sheet and stay bolts showed unquestionably that low water was the cause of the explosion. The expert witnesses for the plaintiff in that case expressed a contrary opinion. Under that status of the evidence this Court held that it was proper to submit

the question of recovery to the jury and judgment for the plaintiff was affirmed.

In the case at bar a number of these same arguments were advanced by defendant's expert witnesses, and all of them satisfactorily answered by the plaintiff's. In fact there was nothing about the appearance of the crown sheet which could not have been accounted for equally as well by a previous overheating of the sheet or by overheating from scale, mud or oil as by a heating at the time of the explosion from low water.

On page 426 of our Record the Government expert, Williams, testified that the only difference between the appearance of the crown sheet if the explosion had been caused by low water, and its appearance if it was caused by previous overheating, was that in his opinion the signs of the previous overheating would have been obscured by smoke and scale. He admitted, however, that he had never seen an explosion except where low water had been attributed as the cause. On the other hand plaintiff's expert witness, Professor Randolph, testified that the effect of the explosion would be to remove all soot and scale from the crown sheet. (Record Pages 519-520, 525). The same condition with respect to the absence of scale from the crown sheet after the explosion existed in the Donaldson case. (See Page 180 of the Record in that case.)

With reference to the quilting or slightly pocketed condition of the crown sheet between the bolt heads, which opposing counsel here emphasize so strongly in their brief as unmistakable evidence of a low water explosion, it may be said that the evidence in the Donaldson case showed that the crown sheet in that case was in the same condition.

It is also worthy of mention that in the Donaldson case it was testified to as a fact, and was not disputed, that the fireman can always tell whether the injector is properly working and forcing water into the boiler. (See Page 18, Donaldson Record.)

Bearing in mind that in the case at bar the fireman testified that the water glass showed that the boiler contained ample water to prevent an explosion, and that the injector was properly working, and that the plaintiff's witnesses, Professor Randolph and Arthur Scrivenor, stated that in their opinion the explosion resulted from defective bolts, and remembering also that the verdict of the jury is in favor of the plaintiff, it is obvious that the contention of the defendant that the conditions found afterwards conclusively showed low water as the sole cause of the explosion, cannot be sustained unless the Court can say, without seeing the crown sheet, that it is physically *impossible* for plaintiff's evidence to be true. This Court declined to so decide in the Donaldson case where the evidence of the Railroad was much stronger than in the case at bar, and where the physical laws applicable and questions arising under them were substantially the same. On the first trial the learned judge of the trial Court and the jury, which actually saw the remnants of the explosion in the case at bar, and were in the best position to judge of the merits of this contention of the defendant, declined to uphold it, but decided the issue in favor of the plaintiff. We respectfully submit that this Court should decline to say that this finding of the jury and trial Court is unsupported by any evidence.

V. The Defendant's Contention That the Testimony of its Witnesses That They Performed Their Duty of Inspecting the Boiler and Water Glass Conclusively Establishes That the Boiler and Water Glass Were in Safe and Proper Condition Within the Meaning of the Boiler Act.

In our original brief, (Pages 56-64), we made a careful analysis of the defendant's evidence upon this point and showed that, even conceding the truth of everything its witnesses said, still the inspections claimed to have been conducted were not such as would have revealed the defective condition of the water glass or boiler. We also called attention to decisions

of this Court in cases under the other safety appliance acts in which evidence of this character had been held by this Court not to establish that the appliances inspected were in safe and proper condition.

We now call the Court's attention to the fact that it appears from pages 156 and 157 of the record in the *Donaldson Case, supra*, that the crown sheet of the engine in that case was inspected just before the engine left on the trip on which the explosion occurred, *and the inspector testified that the crown sheet had no sags at any place between the bolts and that no bolts were leaking.*

This Court held, however, that the question of whether the boiler was unsafe was properly submitted to the jury, and therefore it resulted that this Court refused to hold that such evidence established as a matter of law that the Great Northern Railway Company had complied with its statutory duty of furnishing a boiler in proper condition and safe to operate.

*This point of itself necessitates a reversal of the Court of Appeals of Virginia in the case at bar*, because said Court expressly held that such evidence of inspection *did* require the finding as matter of law that the railway company had complied with its statutory duty of furnishing a boiler in proper condition and safe to operate.

But in addition to the decision of this identical question by this Court in the *Donaldson* case, it is well established by the authorities that the jury are not bound to accept the testimony of an employee *that he did what it was his duty to do*, because if he should admit that he did not do it, he would be confessing his own culpability. Therefore such testimony is universally held not to be that of a disinterested witness. It is sufficient upon this point to give the following quotation from the opinion of this Court in the case of *Texas and Pacific Railway Company v Carlin 189 U. S. 354*:

> "Upon the second ground, we are of opinion that there was evidence sufficient to go to the jury upon the question of the negligence

of the foreman in failing to discover the maul upon the bridge immediately prior to the passage of the train. The foreman himself swears that he did look along the track just prior to the coming of the train, and that he did not see any obstruction on the track, and did not see the spike maul in question. Whether he looked or not is, under the evidence, one of the material facts in the case. He says that he did, but we are of opinion that other facts proved in the case were of such a character as to make it proper to submit the question to the jury. The foreman's evidence was that of a somewhat interested witness. If the foreman did in fact neglect to perform his duty by looking over the track just prior to the coming of the train for the purpose of seeing that the bridge was clear of obstruction, it might be quite a serious matter for him in his future relations with the company. At any rate, *no man is an absolutely disinterested witness where his testimony relates to the question of the performance or non performance of a duty* which he owed on account of the position which he occupied. It was, therefore, a question for the jury as to what measure of credence should be given to his testimony".

We submit therefore that the circumstances shown by the testimony of the fireman, Walton, justified the jury in completely disregarding the testimony of defendant's employees that they performed their duty of inspecting.

VI. The Admission of Defendant That the Testimony of the Fireman Permits an Inference That the Water Glass was Unsafe, and its Contention That Notwithstanding Same the Plaintiff's Intestate was Guilty of Negligence Which was in Law the Sole Cause of the Explosion.

The opposing brief at Page 31 says:

> "There is absolutely no evidence tending to show that the water glass gauge was defective or failed to properly register the water in the boiler *except the testimony of Jerry Walton* before referred to".

We take it that this is an admission that the evidence of this witness permits a finding that the explosion occurred under circumstances where the water glass indicated water in the boiler. Defendant's contention is that the conditions found after the accident conclusively showed low water, as the cause of the explosion, (with which contention we have already dealt), and that therefore the water glass must have registered incorrectly. They then contend that if this was the case, the decedent engineer *should have discovered* the defective condition, and his failure to discover it was negligence which was the *sole* cause of the explosion.

In our original brief, (Pages 77-81), we called attention to the several explosion cases in which recovery was upheld upon the theory of a defective water glass, though in those cases *contributory* negligence would have been a complete defense.

In the *Donaldson* case, supra, this Court held that it was proper to submit to the jury the question whether the failure of the railroad to have a fusible plug installed in the crown sheet contributed in part to cause the explosion. The function of the fusible plug was to warn the engineer of low water. The railroad contended that if the engineer allowed the water to get low, this was negligence which was the *sole* cause of the explosion, but that contention was rejected.

Applying this same principle to the railroad's last named contention in the case at bar, it would seem obvious that the Court cannot say, *as matter of law*, that the failure of the engineer to discover the defect in the water glass was the sole cause of the explosion, and that the defective condition of said water glass did not contribute, *in part*, to cause same.

The principle applied to the facts in the case of *Grand Trunk Ry. Co. v Lindsay, 233 U.S. 42*, serves also to dispose of this contention of the defendant. In that case the plaintiff was injured while attempting to effect a coupling of two cars which would not couple automatically upon impact. After this defective condition was known to the plaintiff, there was evidence that he gave the engineer a "come ahead" signal and then stepped between the cars. The railroad contended that such conduct constituted negligence on his part and that such negligence, intervening between the condition of the coupler and the injury, as matter of law, constituted the *sole* cause of the injury. In disposing of this contention this Court said that "in the view most favorable to the railroad, the case was one of *concurring* negligence; that is, was one where the injury complained of was caused both by the failure of the Railway Company to comply with the Safety Appliance Act and by the contributory negligence of the switchman in going between the cars".

In our original brief we referred to several additional decisions of this Court, applying the same principle to various other situations. The defendant does not cite a single authority in support of its contention that the defective water glass must be held not to contribute in part as a legal cause of the explosion, and we respectfully submit that no such authority can be found.

## CONCLUSION

The case here turns upon the construction of the Boiler Act. It was in distinguishing this act from the other safety appliance acts, and in holding that the duty thereby imposed was discharged by evidence of inspection that the Court of Appeals of Virginia committed its first and chief error. The manifest errors contained in its recitals of evidence are clearly due to its view of the nature of the duty imposed by this act, since if its construction of the act had been correct,

the mistakes made in reciting the evidence would not have been material. The rule laid down by this court for determining the question of the sufficiency of evidence prevails in Virginia. In the recent case of City of Norfolk v Anthony, 117 Va., 783, it was said:

> "It is furthermore well settled by the Supreme Court of the United States and this Court, by practically an unbroken line of decisions, that negligence only becomes a question of law to be taken from the jury when the facts are such that fairminded men can only draw one inference therefrom. If fairminded men, from the proofs submitted, may honestly differ as to the negligence charged, the question is not one of law, but one of fact, to be determined by the jury under proper instructions from the Court".

Considering the evidence under this rule, and applying thereto the principle of construction of the Boiler Act which was established in the *Donaldson* Case, supra, there can be no doubt as to conclusion to be reached.

We earnestly submit that the judgment complained of must be reversed.

Respectfully submitted,

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Office Supreme Court, U. S.
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JAMES D. MAHER,
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# Supreme Court of the United States

## OCTOBER TERM, 1917

## No. 3[redacted]82

MAUDE L. ANDREWS, ADM'X OF A. W. ANDREWS,
Deceased, Plaintiff in Error

*vs.*

VIRGINIAN RAILWAY COMPANY,
Defendant in Error

## In Error to the Roanoke County Circuit Court, State of Virginia

BRIEF OF COUNSEL FOR PLAINTIFF IN ERROR

THE STONE PRINTING & MFG. CO., ROANOKE, VA.

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# Supreme Court of the United States

**OCTOBER TERM, 1917**

No. 341.

MAUDE L. ANDREWS, ADMINISTRATRIX
OF A. W. ANDREWS, *Deceased*,
*Plaintiff in Error*

*vs.*

VIRGINIAN RAILWAY COMPANY,
*Defendant in Error.*

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IN ERROR TO THE ROANOKE COUNTY CIRCUIT COURT, STATE OF VIRGINIA.

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## BRIEF OF COUNSEL FOR PLAINTIFF IN ERROR.

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### STATEMENT OF THE CASE.

This writ of error is prosecuted to obtain a reversal of a final judgment of the Circuit Court of Roanoke County, Virginia, in favor of the defendant in error, who was defendant below, which was rendered upon defendant in error's demurrer to the evidence in an action instituted by plaintiff in error to recover damages sustained by the widow and four infant children of Arthur W. Andrews, who was killed while in the discharge of his duties as locomotive engineer in the employment of defendant in error.

The action was originally commenced in the Circuit Court of Montgomery County and the declaration was filed on the first Monday in April, 1914. The first trial was had in October, 1914, which resulted in a verdict of the jury in favor of plaintiff in error. (Record, Page 574.) The motion of the defendant in error to set aside this verdict and grant it a new trial, upon the ground, among others, that the verdict was contrary to the law and the evidence, *was overruled* by the Circuit Court and judgment entered in favor of the plaintiff in error. (Record, Page 574.) This judgment upon writ of error, the Supreme Court of Appeals of Virginia reversed, and awarded a new trial, upon the ground that under the Act of Congress requiring common carriers engaged in interstate commerce to equip their locomotives with safe and suitable boilers and appurtenances thereto, a recovery could only be founded upon proof of *negligence*, that the evidence was not sufficient to sustain a finding that defendant in error *was negligent*, and that the verdict was, therefore, contrary to the law and the evidence.

By an order entered at the May, 1916, term of the Circuit Court of Montgomery County, the case was, by agreement of parties, removed to the Circuit Court of Roanoke County. (Record, Page 589.) On June 16th, 1916, the second trial was had. At this trial, the plaintiff and defendant each offered, respectively, the same evidence they had introduced at the first trial, the defendant demurred to the evidence, and the plaintiff joined therein. (Record, Pages 590-591.) The sole purpose of the second trial was to secure a final judgment which could be reviewed by this Court, since a writ of error did not lie to the judgment of the Court of Appeals allowing a new trial, as it was not final in form, though in substance it was, because the Court of Appeals had held that the evidence was not sufficient to sustain the verdict and judgment of the Circuit Court in favor of the plaintiff, and this became the law of the case, precluding the Circuit Court from again

entering judgment for plaintiff unless the evidence should be materially different, which it would not have been.

*Virginian Railway Company vs. Bell, 118 Va. at Page 495.*

The Circuit Court, although it regarded the evidence sufficient under its construction of the Federal Boiler Act, was compelled to follow the holding of the Court of Appeals, and therefore sustained the defendant's demurrer to the evidence and entered judgment thereon in its favor. (See opinion of the lower Court, Record, Page 604.)

This judgment, entered in accordance with the opinion of the Court of Appeals, said Court, of course, refused to review by writ of error and declined to take jurisdiction. (Record, Page 606.) The present writ of error, therefore, is directed to the judgment of the Circuit Court, entered June 16th, 1916.

*Western Union Telegraph Co. vs. Crovo, 220 U. S. 364.*

*Norfolk & Southern Turnpike Company vs. Virginia, 225 U. S. 264.*

*Coe vs. Armour Fertilizer Works, 237 U. S. 413.*

## PLEADINGS.

*The declaration*, consisting of seven counts, is grounded on defendant's violation of the Federal Safe Boiler Act, resulting in the death of plaintiff's intestate, and defendant's consequent liability therefor under the Federal Employers' Liability Act. The title of the Boiler Act is as follows:

> *"An act to promote the safety of employees and "travelers upon railroads by compelling common "carriers engaged in interstate commerce to equip "their locomotives with safe and suitable boilers and "appurtenances thereto."*

Section 2 of the Act (36 Stat. 913, U. S. Comp. Stat., 1916, Section 8631), provides as follows:

*"From and after the first day of July, nineteen "hundred and eleven, it shall be unlawful for any "common carrier, its officers or agents, subject to this "act, to use any locomotive engine propelled by steam "power in moving interstate or foreign commerce "unless the boiler of said locomotive and appur- "tenances thereof are in proper condition and safe "to operate in the service to which the same is put, "that the same may be employed in the active service "of such carrier in moving traffic without unnecessary "peril to life or limb; and all boilers shall be in- "spected from time to time in accordance with the "provisions of this Act, and be able to withstand "such test or tests as may be prescribed in the rules "and regulations hereinafter provided for."*

The water glass is admittedly an appurtenance of the boiler, within the meaning of the act. (Record, Page 515.)

The first count of the declaration (Record, Page 33), avers that on November 14th, 1912, the defendant, the Virginian Railway Company, was operating a certain freight train bound from Roanoke, Virginia, to Princeton, West Virginia, over its line of railroad extending between these points; that the plaintiff's intestate, Arthur W. Andrews, was the engineer of the locomotive, No. 469, which was drawing said train; that the said train and said plaintiff's intestate were both engaged in interstate commerce; that under these circumstances the defendant was under duty to the plaintiff to have the boiler of said locomotive in proper condition and safe to operate in the service of drawing said train; that said defendant violated said duty and had said locomotive equipped with an unsafe boiler, the elements of unsafety being that the said boiler was improperly constructed; that the material of which the crown sheet and stay bolts were built was faulty and defective; that said crown sheet was weak and had been previously burned or overheated; that the stay bolts and crown bolts were weak and unsafe, had been previously burned or overheated and broken in service and were unable to with-

stand the strain of service; that while the plaintiff's intestate was engaged in the performance of his duties as engineer the crown sheet of said boiler suddenly gave way, allowing the water and steam to escape from the boiler into the cab of the engine, scalding and injuring the plaintiff's intestate so that he died therefrom on the following day; that the intestate's widow and four infant children ranging in age from one to seven years survive his death, and by reason of being deprived of the support and contributions from his earnings, and his services, etc., they have been greatly damaged by the death of the husband and father. The damages are laid at $50,000.00.

The fifth count (Record, Page 584) is substantially the same as the first, the only difference being the omission of the allegations as to certain elements of unsafeness of the boiler, the only element embraced in the fifth count being that the stay bolts and crown bolts had been previously overheated and burned and broken, and were weak and unsafe and unable to withstand the strain to which they were normally subjected in service. In other respects, the first and fifth counts are the same.

The sixth count (Record, Page 585), is the same except that it merely alleges that the stay bolts, crown bolts and crown sheet of the boiler were weak and unsafe and unable to withstand the strain of ordinary steam pressure, without specifying the cause of the weakness, and that said bolts and sheet failed and gave way at a time when there was ample water in the boiler to prevent said bolts and sheets from being weakened by overheating.

The third count (Record, Page 37) contains the same general allegations as the foregoing, but is based upon the averment that the water glass, being unsafe and not in proper condition, misled the engineer and fireman into thinking that the boiler contained an ample supply of water when in fact it did not; that by reason of the absence of a sufficient quantity of water in the boiler the crown sheet and bolts became overheated and gave way under

the steam pressure. The water glass is alleged to have been unsafe because the openings through which the water circulates between the boiler and water glass had been stopped up.

The seventh count (Record, Page 587), also based upon the allegation that the water glass was unsafe, contains the same averments except that it does not attempt to specify in what particular the water glass was unsafe. The charge is that a few moments before the explosion the fireman observed the water glass and it indicated that the boiler was over three-fourths full, and that before the water thus indicated to have been in the boiler could have been vaporized into steam and thus consumed in sufficient quantity to reduce the water level to the point of exposing the crown sheet, the explosion occurred.

The second and fourth counts were abandoned at the first trial and need not be considered.

To the plaintiff's declaration, the defendant pleaded not guilty (Record, Page 603), and after all the evidence was completed, demurred to the evidence, upon the following five alleged grounds (Record, Pages 590-591):

(1) "That said evidence does not show that "the defendant was guilty of any negligence which "was the cause of the accident.

(2) "That it appears from the evidence that "the said defendant discharged its duty to the "plaintiff's intestate by turning over to him a "locomotive engine and boiler and appurtenances "in proper condition and safe to operate, in the "service to which the same was put.

(3) "That the evidence shows that the ex-"plosion which resulted in the injury and death of "the plaintiff's intestate was caused by low water "due to the sole negligence of the plaintiff's in-"testate.

(4) "That the evidence shows that if said ex-"plosion was not caused by low water, that it was

"due to the sole negligence of the plaintiff's in-
"testate in his failure to perform his duty of
"properly inspecting said boiler.

(5) "That if the evidence fails to show that the
"accident which resulted in the injury and death
"of plaintiff's intestate was not due to the sole neg-
"ligence of the plaintiff's intestate, as above
"specified, that it necessarily shows that the injury
"was the result of an accident which was unforeseen
"and could not be guarded against, and which was
"ordinarily incident to the employment of the
"plaintiff's intestate, or of which he knew, or should
"have known, the risk of danger from which he
"assumed."

The plaintiff's joinder in the demurrer to the evidence is as follows (Record, Page 591):

"And the plaintiff says that the matters afore-
"said to the jurors in form aforesaid, shown in
"evidence, are sufficient in law to maintain the
"issue joined on the part of the plaintiff.

"Wherefore, forasmuch as the said defendant
"has given no answer to the same, the said plain-
"tiff demands that the defendant be convicted,
"that the jury be required to assess her damages
"and that judgment in her favor against the de-
"fendant be entered thereon."

## THE VERDICT.

The jury found in favor of the plaintiff, subject to the opinion of the Court on the demurrer to the evidence, and fixed the damages of the widow and four children at four thousand dollars each. (Record, Page 603.)

## THE JUDGMENT.

The lower court sustained the demurrer to the evidence and entered final judgment for defendant. The reasons for

so doing were thus stated by the Court (Record, Page 604):—

> "Because the evidence is the same as that introduced at the first trial upon which the jury returned a verdict for the plaintiff, upon which verdict this Court rendered judgment in favor of the plaintiff. The Supreme Court of Appeals of Virginia reversed the said judgment of this Court and in its opinion said that the evidence was insufficient to support the judgment of this Court. Under the well established rule, this thereupon became the law of the case, so far as this Court is concerned and is conclusive and binding.
>
> "Judgment is, therefore, given for the defendant against the plaintiff."

The Supreme Court of Appeals of Virginia having refused a writ of error to the foregoing judgment and having declined to take jurisdiction (Record, Page 606), a writ of error was prayed for from this Court, which was allowed by the Presiding and Only Judge of the Circuit Court of Roanoke County. (Record, Pages 605-606.)

With her petition for writ of error, the plaintiff in error, filed the following assignment and specification of errors. (Record, Pages 607-608.)

## SPECIFICATION OF ERROR.

> (1) "The Circuit Court of Roanoke County, Virginia, erred in sustaining the defendant's demurrer to the evidence, setting aside the verdict of the jury in favor of the plaintiff and entering final judgment in favor of the defendant, and in not overruling said demurrer to the evidence and in not entering judgment in favor of the plaintiff for the amount of the damages assessed to her by the said verdict of the jury.
>
> "The said plaintiff, as will appear from the transcript of the record and proceedings in this case, asserted the right to recover damages of the

"defendant, under and by virtue of two certain "acts of Congress, the first approved April 22d, "1908, known as the Federal Employers' Liability "Act (35 U. S. St. at L. 65, c. 149), and the other "approved February 17th, 1911, known as the "Federal Safe Boiler Act (36 Stat. 913). The "said plaintiff, therefore, claimed in this case "rights, privileges, and immunities under the "Statutes and Laws of the United States, which "were denied by the said decision and judgment.

"The said errors in the said judgment are more "particularly set forth as follows: that is to say, "the said Circuit Court erred in sustaining the "said demurrer to the evidence and entering "judgment for defendant and in not entering judg- "ment for the plaintiff, for the following reasons:

(a) "The evidence was sufficient to justify the "jury in finding that when the locomotive engine "No. 469 was delivered to plaintiff's intestate at "Roanoke, on the night of the injury, the stay bolts "and crown sheet of the boiler were not in proper "condition and safe to operate in the service of "drawing the freight train to which it was attached "and that said condition was the proximate cause, "or one of the proximate causes, of the death of "plaintiff's intestate.

(b) "The evidence was sufficient to justify the "jury in finding that when the locomotive engine "No. 469 was delivered to plaintiff's intestate at "Roanoke on the night of the injury, the water "glass, an appurtenance of the boiler of said loco- "motive, was not in proper condition and safe to "operate in the service of registering the quantity "of water in the boiler of said locomotive, while "drawing the freight train aforesaid, and that said "condition of said water glass was the proximate "cause, or one of the proximate causes, of the death "of plaintiff's intestate.

(c) "The evidence as to the circumstances "under which the explosion occurred was sufficient

"to bring the case within the influence of the "maxim, *res ipsa loquitur*, and justified an infer- "ence that the death of the plaintiff's intestate re- "sulted wholly or in part from the explosion of the "locomotive boiler due to an unsafe water glass, or "to unsafe stay bolts or unsafe crown sheet, or a "combination of two or more of said causes, and "that said unsafe condition of said water glass or "stay bolts or crown sheet, or crown bolts, or of "two or more of them, was due to the defendant's "violation of the duties imposed upon it under the "Federal Safe Boiler Statute (36 Stat. 913) to "have the said boiler and appurtenances thereof, "of the locomotive No. 469 in proper condition and "safe to operate in the service of pulling the freight "train it was then engaged in pulling.

(d) "The proper construction of the Federal "Safe Boiler Statute (36 Stat. 913) renders the "defendant liable for an injury resulting from any "improper or unsafe condition of the water glass "gauge, an appurtenance of the boiler, whether "said unsafe or improper condition comes into ex- "istence in transit during the run or whether same "existed before the commencement of the run, and "the evidence justified a finding, on the part of the "jury, that the death of plaintiff's intestate was "caused either wholly or in part, by unsafe stay "bolts or crown sheet or unsafe water glass."

## THE EVIDENCE.

Since the controlling question here does not involve the weight of the evidence, but only the determination of what ultimate facts the evidence tends to prove, the following statement is confined to such ultimate facts and ignores all evidence tending to contradict the same.

On November 14th, 1912, Arthur W. Andrews had been in defendant's employment as locomotive engineer for about a year. He was given a regular freight run between Roanoke, Virginia, and Princeton, West Virginia. He was 38 years of age and was regarded as a careful engineer. (Record,

Page 256.) On the night he was killed, he reported for duty at the Roanoke yards about eight p. m. and at eight forty-five, his train left Roanoke, westbound, and proceeded on its journey. In a very short time, something over an hour, at a point eighteen miles from Roanoke, the boiler exploded, scalding and injuring Andrews so badly that he died therefrom in a few hours. The fireman was the only surviving eye-witness.

As an appreciation of the evidence as to the circumstances surrounding the explosion requires some familiarity with the working principles of the injector and water glass, both appurtenances of the boiler, we will, at this point, endeavor to explain them.

*The injector* is the appliance which replenishes the boiler with water to take the place of that used up in generating steam. This reserve supply is carried in a tank located on the tender. Water flows from this tank, through a faucet or valve, into the combining tube of the injector, (a cylindrical pipe about four inches in diameter), where it is made to combine with the steam in such a manner as to condense it and form a water jet, which imparts to the mixed current a sufficient force or momentum to deliver it into the boiler. The quantity of steam and water admitted into the combining tube is regulated by opening or closing valves, similar to those of ordinary water spigots. (For diagram and explanation, see Standard Dictionary, "injector.") If the quantity of steam admitted is too great for the quantity of water admitted, or vice versa, the excess escapes through the overflow or waste pipe. Sometimes, though very rarely, the quantity of water admitted is so grossly out of proportion to the quantity of steam, or vice versa, that the injector fails to work, and both steam and water escape through the overflow. When this occurs, according to the railroad term applicable, the injector "breaks," and the proper procedure is to shut off both steam and water and again turn them on in proper relative quantities, so that they will "catch." If the in-

jector starts working properly, it necessarily continues to work unless the steam pressure falls too low. (Record, Pages 267, 270, 281.) The injectors on the locomotive involved in this case would work properly even when the steam pressure was as low as 100 pounds. (Record, Page 431.) If the injector did "break" for any cause, however, the engineer or fireman could tell it instantly, because of the hissing sound of escaping steam, whereas, the sound given forth when working properly is a solid ringing sound easily audible in the engine cab. (Record, Pages 46, 48, 71, 72, 243, 431.).

The engine was equipped with two injectors, one on the right and the other on the left side of the cab, but one injector is all that is required to supply ample water to the boiler. The other is for use only in the event that the one being utilized should get out of repair. (Record, Pages 45, 54, 264, 277, 290, 377.)

*The water glass gauge* occupies a vertical position on the boiler head, and is easily visible to the engineer and fireman while discharging their duties in the engine cab. There are two openings leading from this gauge into the boiler, one opening at the top and the other at the bottom of the water glass. This is necessary in order to obtain a correct register of the water level inside the boiler. From the laws of physics, it is obvious that if the top opening becomes closed or stopped up, the steam pressure from the boiler, through the lower opening, will force the water high up into the water glass, whereas, if said top opening remains open, the pressure from the boiler will be exerted through it and, by neutralizing the pressure exerted through the lower opening, a proper water level will be maintained. If, on the other hand, the lower opening becomes closed, not only is the water which the glass contains prevented from re-entering the boiler if the water level of the boiler drops, but the steam which is forced into the glass through the upper opening is being constantly condensed into water,

causing a gradual rise in the water level indicated by the glass.

In the ordinary operation of the engine, evaporation of the water into steam causes a precipitation of lime and similar mineral substances contained in the water, which forms a deposit or hard scale on the crown sheet and all metallic surfaces with which the boiling water comes in contact. This scale is being constantly deposited, in minute particles, on the surface of the openings which lead from the water glass into the boiler, and must be cleaned off in order to maintain the water glass guage in proper condition. The evidence was uncontradicted that if the openings had been in anything like proper condition when the engine was put into service at Roanoke an hour or more before the explosion, the deposit of scale in the openings could not have been sufficiently rapid to stop up the openings in the time which elapsed before the explosion. (Record, Pages 118, 119.).

*The Crown Sheet* of the boiler is that portion exposed directly to the fire. In the locomotive in question, it was made of iron, three-eighths of an inch in thickness, and was supported in place, from above, by one-inch wrought iron stay bolts, spaced four by four inches. Each bolt, therefore, supported the strain exerted by the steam pressure upon sixteen square inches of the crown sheet's surface, which, at the boiler pressure of 185 pounds to the square inch, was a strain of 2,960 pounds on each bolt. It was not disputed that the crown sheet supported as it was, if properly constructed of proper material, should have withstood more than twelve times the boiler pressure, if said sheet and bolts had been in proper condition.

An examination of the crown sheet and bolt heads by plaintiff's expert witnesses led them to the opinion that the said sheet and stay bolts had been overheated *on some occasion prior to the time of the explosion.* Defendant's experts, on the other hand, thought that the appearance of the wreckage indicated that the explosion was caused by

the crown sheet and bolts having been overheated *at the time of the explosion.*

Under this state of expert testimony, plaintiff contends that either one of two grounds of liability is necessarily established by the evidence in this case:

> (a) "*The evidence warranted the jury in finding "that the stay bolts were unsafe and had been pre-"viously overheated and damaged and this caused "the explosion; also*
>
> (b) "*The evidence of the circumstances attend-"ing the explosion, that is, that the water glass "showed ample water in the boiler, taken in connec-"tion with defendant's opinion evidence that the "wreckage indicated absence of water in the boiler at "the time of the explosion, warranted the jury in "inferring that the water glass gauge was not in "proper condition and safe to operate.*"

The evidence of the circumstances of the explosion consists of the testimony of the fireman, Jerry Walton, and the testimony of defendant's witness, Scott, that Walton told him immediately following the explosion, that the boiler had exploded when the water glass showed it was full of water.

Walton's testimony was in substance as follows:

The witness had been a locomotive fireman for about eighteen months last preceding the time of the accident, and had fired on other engines of the same class and kind as the one on which the explosion occurred. (Record, Pages 45, 54.) He was the fireman on Locomotive No. 469 when the explosion occurred. On leaving Roanoke, at the beginning of the trip, the plaintiff's intestate, who was engineer, turned on the right injector. (Record, Page 45.) One injector, if working at full capacity, would always supply to the boiler as much or more water than the engine would consume. (Record, Page 45, 54.) At his position in the cab, the witness could clearly hear the injector, and

could easily tell from the sound it gave forth whether it was working properly and forcing water into the boiler. (Record, Pages 45, 46.) This he could do, because when the injector "breaks"—that is, when the steam which is admitted into the combining tube of the injector fails to "catch," or combine with, the water,—both water and steam escape and the escaping steam makes a hissing noise, whereas when properly working a solid, ringing sound is produced. (Record, Page 48.) The witness listened to the injector constantly, and it was at all times, up to the very moment of the explosion, working properly and forcing water into the boiler. (Record, Pages 45, 46, 47, 48, 49.) (As to whether the injector was working *at full capacity*, this witness does not attempt to say.) Upon leaving Roanoke, he looked at the water glass gauge, and it then showed the boiler to be about half full of water. (Record, Page 45.) He observed it at intervals during the trip, and the water level in the glass increased steadily up to the time he looked at it last. (Record, Pages 55, 57, 58.) The last time he looked at the glass was as they were passing Singer Tank, when the water registered about half an inch from the top of the glass. (Record, Page 48.) This was, according to his estimate, about three or four minutes before the explosion. (Record, Pages 54, 58.)

A moment before the explosion occurred, this witness threw in several shovelfuls of coal, and the injector was working properly at that time. (Record, Page 47.) As he was getting back on his bench and was in the act of leaning out of the window, the explosion occurred. (Record, Pages 47, 48.) He was blown out of the window and the next thing he knew he lit on his face and breast. There was a great deal of water blown into the cab and the witness' clothes were wet all over. From where he was thrown he could not see Andrews, but could hear him struggling in the dark. When the witness was found by the defendant's witness, Scott, the conductor, he told Scott that the boiler

had exploded when it was full of water. (Scott's testimony, Record, Page 255.)

For proof of the quantity of water that the boiler contained when the water glass stood at the point indicated by the fireman's testimony, the plaintiff was compelled to rely upon the evidence of defendant's witness Slayton, who was the Company's Superintendent of Motive Power. This witness had made calculations on the witness stand at a former trial to determine this fact, and when the case was tried, as shown by the record now before the Court, he had, since the former trial, made accurate calculations from drawings and blue prints in the office of the Baldwin Locomotive Works, the builders of the engine. (Record, Page 376.) These calculations showed that when the water glass registered one inch from the top of the glass, the boiler contained 1,296 gallons above the point three inches below the top of the crown sheet, which was the point where the water stood in the boiler when the crown sheet was overheated. (Record, Page 376.) Therefore, for the crown sheet to have been exposed from lack of water at the time of the explosion would have required the consumption by evaporation of 1,296 gallons of water after the fireman observed the water glass at Singer Tank, in addition to the water being supplied by the injector in the meantime,—which the evidence shows was impossible.

The defendant's evidence also established the distance between Singer Tank and the place where the explosion occurred which was claimed by defendant to be two and one-half miles. (Record, Page 253.) While the fireman estimated that only three or four minutes elapsed after he looked at the water glass at Singer Tank until the explosion occurred, still, if the above distance between the two points be taken as correct, since the fireman stated that the train was traveling only eighteen or twenty miles per hour (Record, Page 58), seven and a half to eight and one-third minutes may be taken as an accurate statement of the time which actually transpired.

The evidence is conclusive that the boiler could not have vaporized 1,296 gallons of water in eight and one-third minutes, even if the injector had not been working during this time, as was admitted by defendant's said witness, Slayton. This witness at first stated that the 1,296 gallons could have been consumed. (Record, Page 377.) When confronted, however, with the fact that the utmost capacity of the injector to supply water to the boiler was $116\frac{2}{3}$ gallons per minute and with the further fact that every witness in the case had testified that one injector can always furnish as much or more water than the boiler can vaporize, and that, therefore, the greatest quantity of water that the engine could vaporize was $116\frac{2}{3}$ gallons per minute, he realized that his statement was palpably erroneous and admitted that the 1,296 gallons could not have been used up in that time. (Record, Pages, 377, 378, 379.) As a matter of fact, the engine does not ordinarily consume more than 100 gallons of water per minute, and in traveling between Singer Tank and the place where the explosion occurred would not have consumed more than eight hundred gallons. (Record, Page 378.) Defendant's foreman of engines testified that between Roanoke and the place of the accident, engines of the type in question would ordinarily consume six thousand gallons of water. (Record, Page 292.) As this distance was eighteen miles, the average consumption at this rate would be $333\frac{1}{3}$ gallons per mile, or $833\frac{1}{3}$ gallons between Singer Tank and the place of the explosion. Thus defendant's own estimate of the average per mile consumption of water by engines of this type agrees with its per minute estimate, each leading to the enclusion that only about eight hundred gallons could have been consumed after leaving Singer Tank until the explosion occurred.

Taking up the expert testimony given by witnesses who examined the crown sheet and bolt heads after the explosion, as it is not regarded as necessary to consume the Court's time with a consideration of the relative weight or merits of the directly contrary views expressed by the witnesses for

the plaintiff and defendant, respectively, we will call attention only to the testimony of plaintiff's witnesses on this subject. By demurring to the evidence, the defendant has conceded the truth of plaintiff's evidence, and all reasonable inferences therefrom, and has waived its evidence in conflict therewith; so the only question here is whether in the light of these admissions and waivers, there was enough evidence to sustain the plaintiff's verdict.

Plaintiff introduced two mechanical engineers, Arthur Scrivenor and L. S. Randolph, who examined the crown sheet and bolt heads of the exploded boiler, which were introduced into evidence and were before the trial court and jury.

Arthur Scrivenor, after stating his experience of about twenty-five years in connection with the construction of boilers and in foundry work and machine shops, expressed the opinion that the appearance of the crown sheet did not indicate that the explosion occurred from low water, but that, in his opinion, the slight bags shown in the sheet were caused by the sheet having been overheated on some previous occasion. (Record, Page 105.) He testified from scientific text books that the bolts which broke, if they had been in proper condition and of good material, should have sustained greater strain than they were subjected to by the boiler pressure, unless the bolts and sheet had been heated to a higher degree of temperature than a bright red heat, i. e., white heat. (Record, Pages 90, 91.) He further stated that if the sheet had been heated to a white heat, its appearance would have been very different from what it was, that instead of the blue color, it would have been brownish red, and instead of being smooth it would have been scaly and rough, and that, from the appearance it presented, he did not think that the sheet could have been heated to a greater temperature than 1,000 to 1,200 degrees, Fahrenheit. (Record, Pages 88, 89.) The tables in Kent's "Mechanical Engineers Pocket book" showed that at 1,300 degrees, F.,

good fibrous wrought iron should stand a strain of 6,000 pounds per square inch. (Record, Page 90.)

L. S. Randolph testified that he had learned the trade of machinist in the shops of the B. & O. R. R. Co., and after spending three years there, he subsequently graduated as a mechanical engineer at the Stevens Institute of Technology; that he afterwards had a great deal of experience as Superintendent of Motive Power and in other positions with five different railroads, and that for the last twenty-one years he had been Professor of Mechanical Engineering at the Virginia Polytechnic Institute, a State Institution, and had also done considerable consulting work.

This witness stated that he had made an examination of the crown sheet of the exploded locomotive; that he saw no indication that the explosion was caused by low water; that the sheet's appearance indicated that it had never been heated above a dull red heat, because it was blue in color and smooth, whereas, if it had been heated sufficiently hot to cause an explosion in a boiler in proper condition, the sheet would have been rough and reddish in color; that the sheet still had the mill scale on it, which was made at the time the sheet was rolled, and this scale would have been destroyed if heated above the dull red (Record, Pages 113, 114); that at a dull red heat, sound bolts of that size should have withstood a strain of between eight and ten thousand pounds, whereas the strain on each bolt at the maximum boiler pressure was only 2,960 pounds and that if the bolts had been in good condition, they could not have broken from being overheated unless they had been heated hotter than a bright red. (Record, Page 115.) The witness stated, furthermore, that when the crown sheet is in the engine, it occupies a sloping position, the forward end being higher than the rear end, and, therefore, in the event of low water, the forward end would be first exposed; that an examination showed that some bolts in the highest part of the crown sheet had not been broken, while others lower down had broken; that the ones which did not break

would have been the first to become exposed if there had been low water at the time of the explosion, and consequently would have been subjected to the heat longer than those which did break; and that this condition indicated that the explosion was not caused by low water. (Record, Pages 119-121.)

This witness also stated that the line of demarkation in color on the broken surface of three of the twelve bolt heads which the defendant introduced in evidence, showed that a part of the fracture had occurred when the bolt heads were hot, and the balance of the fracture occurred when they were at the ordinary boiler temperature, or "cold." (Record, Pages 136, 137.) This indicated that the bolt heads had been previously overheated and were cracked at that time, and that when the crown sheet failed the balance of the fracture took place. Thus, twenty-five per cent. of the bolt heads which the defendant selected and brought into Court showed that they had been previously broken. If the same percentage of the 160 bolts which broke were in this condition, then there were about forty broken bolts in the boiler previous to the explosion. This, we submit, is an inference which the plaintiff is entitled to have drawn from the above testimony, and this was sufficient, in and of itself, to have caused the explosion. (Record, Pages 134, 135.) This witness also testified as to the various defects in material or workmanship which might cause the explosion of a locomotive boiler.

The testimony of both plaintiff's and defendant's witnesses showed that engines are commonly in service, the crown sheets of which have been overheated on some previous occasion, said sheets having the small bags between the bolts and presenting an appearance similar to the smaller bags found on the crown sheet in this case. (Record, Pages 144, 145, 421, 422; 457, 497.) Two of the boiler men from the Norfolk & Western Railway Company stated that that road had in service at the time of the trial twenty-five or thirty engines in that condition, the crown sheets of

which had been previously overheated. (Record, Page 457, 497.)

The following tests as to the quality of the stay bolt iron going into boilers built at the Baldwin Locomotive Works are shown to have been customarily made:

The material of which the bolts are made originally consists of a square billet of iron. From this billet, 15 to 20 bars, approximately fifteen feet in length, are rolled and placed in a bundle, with a serial number stamped on them for identification. This bundle is called a "heat" and a specimen about one foot long is taken from one of the bars and subjected to a test, and if this proves satisfactory, the entire heat or bundle is accepted. (Record, Pages 174, 175; 163.) The evidence does not show that the material of which the stay bolts in the exploded boiler were made, ever was actually tested, or that any stay bolt material actually tested was in fact used in this boiler. (Record, Page 176.) Four or five bolts were made from each bar, or sixty to seventy-five bolts from a bundle or heat. (Record, Page 163.) Thus, if one defective or improperly tested heat was used in the building of the boiler which exploded, the result was that the boiler contained from sixty to seventy-five bad bolts.

Certain inspections were claimed to have been made of the boiler and water glass before the engine was delivered for the trip, but as this evidence is only to the effect that no defects *were discovered*, and by no means *compels* the inference that the boiler and water glass were *in fact* free from defects, and as all inferences from defendant's evidence, *save necessary ones*, are waived on the demurrer to the evidence, it is not considered necessary to notice this evidence in detail, because the Federal Boiler Act imposed the absolute duty upon the defendant to actually have the boiler and water glass in safe condition, and this duty is not discharged by mere proof of proper inspection. Furthermore, the only inspection claimed to have been made of the boiler before delivery for the trip was by a hostler who

said he looked at the crown sheet through the fire box door when there was fire in the fire box. He declined to state that the crown sheet was not then pocketed between the bolts but said that he did not know whether it was pocketed or not (Record, Page 239), and defendant's witness, Richardson admitted he could not tell by this method of inspection whether the crown sheet had been previously burned or not. (Record, Page 295.) As to the water glass, one hostler said he examined it when the engine came in the morning before the accident and found it then "open." (Record, Page 229.) Another hostler said he "tried" the water glass and gauge cocks and they were o. k. (Record, Page 236.) There was no evidence that any inspection was made which would determine whether the openings were *partially* closed with scale.

## BRIEF OF THE ARGUMENT.

### I.

The question of the sufficiency of the evidence to support recovery under the Federal Boiler Act and the Federal Employers' Liability Act presents a Federal question of law which this Court may review on writ of error, and as the trial court and State Appellate Court did not agree upon the answer to said question, the plaintiff in error is entitled to the independent consideration and conclusion of this Court, and unless the testimony is such that no recovery can be had upon the facts shown, in any view which can be properly taken of them, the plaintiff in error is entitled to have judgment entered upon the verdict of the jury in her favor.

*Chicago R. I. & P. Ry. Co. vs. Devine, 239 U. S. 52.*
*Seaboard A. L. Ry. Co. vs. Padgett, 236 U. S. 668.*
*Myers vs. Pittsburgh Coal Co., 233 U. S. 184.*
*Coe vs. Armour Fertilizer Works, 237 U. S. 413.*
*Chesapeake & O. Ry. Co. vs. McCabe, 213 U. S. 207.*
*Louisiana Navigation Co. vs. Oyster Commission, 226 U. S. 99.*

II.

The Federal Safe Boiler Act (36 Stat. 913) imposes upon the railroad company the absolute duty to have its locomotives equipped with safe and suitable boilers and appurtenances thereto, at all times while moving interstate traffic.

*St. Louis I. M. & S. R. Co. vs. Taylor, 210 U. S. 281.*
*Chicago B. & Q. R. Co. vs. United States, 220 U. S. 559.*
*Delk vs. St. Louis & S. F. R. Co., 220 U. S. 580.*
*Texas & P. R. Co. vs. Rigsby, 241 U. S. 33.*
*Spokane & I. E. R. Co. vs. Campbell, 241 U. S. 497.*
*Minneapolis & St. Louis R. Co. vs. Gotchall, 244 U. S. 66.*
*Illinois C. R. Co. vs. Williams, 242 U. S. 462.*
*Great Northern R. Co. vs. Otos, 239 U. S. 349.*
*Mason vs. Fearson, 9 How. 248; 13 L. Ed. 125.*
*Logan vs. United States, 144 U. S. 263.*
*United States vs. Mooney, 116 U. S. 104.*
*Kepner vs. United States, 195 U. S. 100.*

III.

The defendant in error demurred to the evidence, and, therefore, the sufficiency of the evidence to support the verdict of the jury in favor of the plaintiff in error is to be tested by the following rule, applicable under the Virginia practice:—

> "The demurrant admits the truth of the demurree's evidence, and all just inferences that a jury might properly draw therefrom, and waives all of its own evidence in conflict with that of the demurree, and all inferences from its own evidence, *although not in conflict with the demurree's evidence,* which do not *necessarily* result therefrom."

*White vs. American Nat'l Life Ins. Co., 115 Va. at Page 307.*

IV.

The evidence as to the circumstances under which the explosion of the locomotive boiler occurred, justified a finding by the jury that the death of plaintiff's intestate was caused, at least in part, by either an unsafe boiler or an unsafe water glass; because the said evidence showed that the boiler exploded when the water glass indicated that there was a large quantity of water in the boiler, that the injector had been continuously supplying water to the boiler, and that if the boiler and water glass had been safe there could not have been an explosion under these circumstances.

(a) The fireman, Jerry Walton, observed the water glass as the train was passing Singer Tank, and the water then registered half an inch from the top of the water glass. (Record, Pages 47, 48.)

(b) When the water properly registers one inch from the top of the water glass, the boiler contains 1,296 gallons of water above the point on the crown sheet where the water stood when the overheating of said crown sheet actually occurred, and if the said water glass registered properly, it would have been necessary for the engine to vaporize or consume said 1,296 gallons between the time of leaving Singer Tank and the time of the explosion, in order for said overheating to have occurred at the time of the explosion. (Record, Page 376.)

(c) The distance from Singer Tank to the place where the explosion occurred was two and a half miles (Record, Page 253) and the train was traveling between these two places at the rate of from eighteen to twenty miles per hour. (Record, Page 58.) Therefore, the time which elapsed in traveling between two said places was from seven and one-half to eight and one-third minutes.

(d) The engine would not ordinarily vaporize or consume more water than one hundred gallons per minute. (Record, Page 378.) The engine never consumes more water than one injector will supply (Record, Pages 45, 54, 264, 277,

290, 377), and the *maximum* capacity of the injector to supply water to the boiler is 116⅔ gallons per minute. (Record, Page 377.) Therefore, the engine *could not* have consumed up to the time of the explosion more than from 870 to 967 gallons of the 1,296 gallons which the boiler contained above the crown sheet at Singer Tank, and under ordinary conditions would not have consumed more than 800 gallons. Furthermore, the accident occurred eighteen miles west of Roanoke (Record, Page 43) and the quantity of water ordinarily consumed by this class engine in traveling from Roanoke to the place of the accident is 6,000 gallons (Record, Page 292) or an average per mile consumption of 333⅓ gallons, or an average consumption between Singer Tank and the place of the accident of 833⅓ gallons. This statement as to the per mile consumption of water by this engine was made by defendant's witness Houston, and agreed with the per minute estimate given by its witness Slayton, above referred to.

(c) Furthermore, the fireman had had eighteen months experience as fireman (Record, Page 45), had previously fired on other engines of the same class and kind as that on which the explosion occurred (Record Page 54), and was able to tell easily from the sound, whether the injector was working properly and forcing water into the boiler, because it then made a solid, rising sound, whereas, when the injector failed to work properly it made a hissing or blowing sound as of escaping steam, and these distinctive sounds made by the injector were easily audible to one occupying the fireman's position in the cab. (Record, Pages 46, 48, 62, 71, 72, 75, 243, 431.) The fireman paid attention to the injector and it was working properly and forcing water into the boiler from the time the train left Roanoke until the time of the explosion. He noticed especially that it was working properly and forcing water into the boiler when he threw coal in at Singer Tank and also when he threw in coal a moment or so before the explosion. (Record, Pages 45, 46, 48, 49.) Therefore, if the

water glass registered correctly at Singer Tank, then, in order for the crown sheet to have become overheated at the time of the explosion, it would have been necessary for the engine to consume not only the 1,296 gallons of water which the water glass showed that the boiler contained above the injured crown sheet level at Singer Tank, but also the additional water which the injector was, at the same time, busily engaged in forcing into the boiler.

(f) If the boiler had been in proper condition and safe to operate, the stay bolts which broke and let the crown sheet blow down should have withstood above twelve times the strain they were subjected to by the maximum boiler pressure. (Record, Page 345.) Therefore, if the said bolts broke when there was water in the boiler, they were necessarily unsafe and not in proper condition, whereas, if they broke because of the absence of water, the water glass, which indicated that water was there, was not in proper condition.

(g) The Supreme Court of Appeals of Virginia was mistaken in saying in its opinion that this was the first trip the fireman, Walton, had ever made on an engine of this class on which the explosion occurred. The said fireman testified that he had previously fired on other engines of the same class and kind. (Record, Page 54.)

(h) The said Court of Appeals was mistaken in saying that on November 11th, 1912, the boiler was inspected by *Government inspectors*. As a matter of fact, the inspection referred to was claimed to have been made by one of defendant's employees, Funk, who had never served his boiler-maker apprenticeship and said he did not claim to be an expert. (Record, Pages 220, 222.)

(j) The said Court of Appeals was mistaken in saying that there would necessarily have been evidence of leakage during the run, after leaving Roanoke, and before the explosion occurred, if the crown sheet had been previously overheated. The testimony of both plaintiff's and defendant's witnesses show that quite a number of engines are

in service on nearly all railroads, the crown sheets of which have been previously overheated, the leaks having been taken out by caulking or some other method. (Record, Pages 144, 145, 421, 422, 457, 497.)

(k) The said Court of Appeals was mistaken in saying that it was in evidence that if the injector was not kept working after the engine left Singer Tank, the boiler would have vaporized sufficient water to expose the crown sheet before the explosion occured. (*Vide* a, b, c, d, *supra.*) The only testimony which the defendant contended should be so construed was that of C. L. Richardson, who said he had tried another engine over the same road bed and with the water glass one inch from the top at Singer Tank, had shut off his injector, and after running a distance of about *two and one-half miles* had again turned on the injector; that in traveling this distance of two and a half miles, the level in the glass had dropped to "one gauge;" that he did not know, except from what had been told him, where the accident happened, but thought that the place where he turned his injector back on was about one mile east of the place where the accident occured, (though defendant's witness Scott, on Page 253 of the Record, testified that the accident occurred only two and a half miles west of Singer Tank, the same distance Richardson traveled); that he did not allow the water to get extremely low, and did not know how far it was necessary to go below the bottom gauge cock, as from there down was the largest part of the boiler. There was no evidence whatever as to what quantity of water remained in the boiler above the crown sheet at the time Richardson turned on the injector, or how long it would have taken to consume same. (Record, Pages 276, 282, 285.)

(l) Evidence that the boiler and water glass had been inspected before the beginning of the trip, and no defect discovered is not conclusive evidence that said appliances were in fact in safe and proper condition, where the circumstances under which the accident happened show that they were not safe and in proper condition.

*Spokane & I. E. R. Co. vs. Campbell, 241 U. S. 497.*
*Grand Trunk W. R. Co. vs. Lindsay, 233 U. S. 42.*

V.

If the evidence as to the circumstances under which the explosion occurred warranted the jury in finding that the death of plaintiff's intestate was caused wholly or in part by either an unsafe boiler or an unsafe water glass, this is all that is necessary to entitle plaintiff to recover under the Federal Safe Boiler Statute.

(a) The duty to have the boiler and water glass in safe and proper condition is absolute and it is no defense that defendant exercised proper care in its inspection (*Vide* II, *supra*), and contributory negligence and assumption of risk are abolished as defenses.

*Spokane & I. E. R. Co. vs. Campbell, 241 U. S. 497.*
*Grand Trunk W. R. Co. vs. Lindsay, 233 U. S. 42.*

(b) The boiler was wrecked by the explosion and it is not necessary for the plaintiff to furnish an explanation of the specific cause of the explosion, but it is sufficient if the evidence raises "a reasonable inference that there was some defect" in the boiler or water glass.

*Spokane & I. E. R. Co. vs. Campbell, 241 U. S. 497.*
*Minneapolis & St. L. R. Co. vs. Gotschall, 244 U. S. 66.*
*Myers vs. Pittsburgh Coal Co., 233 U. S. 184.*
*Souden vs. Fore River Shipbld'g Co., (Mass.), 112 N. E. 82.*

VI.

The evidence as to the circumstances attending the explosion, coupled with the testimony of plaintiff's expert witnesses as to inferences to be drawn from the wrecked crown sheet and bolt heads (which were in evidence), justified the jury in finding that the explosion was caused by

an unsafe boiler and that said unsafeness existed when the engine was delivered to the plaintiff's intestate at the beginning of the trip.

The evidence referred to under IV, *supra*, shows that the explosion occurred when the water glass indicated that there was an ample supply of water in the boiler. Two mechanical engineers examined the crown sheet and twelve broken bolt heads and testified that, in their opinion, the explosion was not caused by low water for the following reasons:—

(a) Because if the sheet had been heated sufficiently hot to cause a failure of sound bolts from overheating, said sheet would have been rough and red, whereas, it was, in fact, smooth and of a blue color. (Record, Pages 88, 89, 90, 113, 114, 115.)

(b) Certain bolts situated at the highest part of the crown sheet, and which would have been the first exposed by low water, did not break when the explosion occurred, whereas, others lower down on the crown sheet did break. (Record, Pages 119, 120, 121.)

(c) A line of demarkation in color on the broken surface of one-fourth of the bolt heads produced by defendant, indicated that said bolt heads had been broken on two separate occasions, first when hot, and secondly, when at boiler temperature or "cold." (Record, Pages 136, 137.)

(d) The Supreme Court of Appeals of Virginia was mistaken in saying that the opinion expressed by plaintiff's expert witnesses was not based on facts within their knowledge or established by other evidence in the case. The crown sheet and bolt heads were introduced in evidence and examined by said witnesses. (Record, Pages 84, 107, 113, 135, 136.)

## VII.

The evidence as to the circumstances attending the explosion, taken in connection with the testimony of *de-*

*fendant's* expert witnesses that the inferences to be drawn from the exploded crown sheet and broken bolt heads showed that the explosion was caused by low water, justified the jury in finding that the explosion was caused, at least in part, by an unsafe water glass and that said unsafeness existed when the engine was delivered to plaintiff's intestate at the beginning of the trip.

(a) The evidence referred to under IV, *supra*, shows that the explosion occurred when the water glass indicated that there was an ample supply of water in the boiler.

(b) Defendant's expert witnesses testified that in their opinion the appearance of the crown sheet and bolt heads indicated that the explosion occurred from an absence of water over the crown sheet at the time of the explosion. (Record, Pages 300, 337.)

(c) The fireman testified that when the engine left Roanoke at the beginning of the trip, the water glass registered a little over half full; that the right injector was then turned on and kept properly working at all times thereafter up to the instant of the explosion; and that the water continued to rise gradually in the water glass until Singer Tank was reached, a few minutes before the explosion. (Record, Pages 45, 46, 48, 49, 55, 57.) If the water actually in the boiler was diminishing in quantity instead of increasing as indicated by the water glass, this could have been due only to the fact that the injector was not working *at full capacity*, and it follows that the water glass was registering erroneously at the outset, else it would, from the first, have indicated a warning of the gradual *fall* of the water level instead of a gradual *rise*.

Furthermore, if the openings leading from the water glass into the boiler had been clean and free from deposit at the beginning of the trip, they could not have become stopped up by the quantity of scale which was deposited after leaving Roanoke. (Record, Pages 118, 119.)

## VIII.

The fact that it was the engineer's duty to inspect his engine, if this was his duty, and run same does not relieve the railroad company from liability for his death if it resulted wholly or in part from a defective boiler or defective water glass.

This proposition is demonstrated by the following considerations:

(a) The only inspection he was required to make of the boiler and crown sheet was to look inside the fire box before beginning the trip, and when there was a fire in said fire box, and it could not be determined from this method of inspection whether or not the crown sheet had been previously overheated or pocketed between the bolts. (Record, Pages 239, 295, 481, 482.) The plaintiff's intestate was seen to make this inspection just before leaving Roanoke. (Record, Page 252.)

(b) The only examination he had the opportunity to make of the water glass was in the time allowed for inspecting the entire engine before the beginning of the trip and at the end of the trip, and at a time when the boiler was under steam. All he could do was to turn the faucet and see if an opening leading from the water glass into the boiler were *then* open, that is, blow out the water glass. This could not possibly determine whether a quantity of scale was then deposited around the surface of the openings so that slight additional deposits would close them entirely. In other words, it is obvious that he could only ascertain that both openings were not *completely* closed, and could not determine that they were not *partially* closed, or that one of them was not completely closed. A hostler claims to have "tried" the water glass before leaving Roanoke and stated that it was then open. (Record, Page 236.)

(c) It was likewise the duty of other employees to inspect the water glass and boiler or crown sheet and if the defect was discovered by inspection, the failure to discover

same was attributable to their negligence also, and therefore, was not caused by the sole negligence of plaintiff's intestate. (Record, Pages 326, 327.) The most that could be said of his failure to discover same would be that he was guilty of contributory negligence, but contributory negligence is abolished as a defense in an action under the Federal Boiler Statute.

*Spokane & I. E. R. Co. vs. Campbell, 241 U. S. 497.*

(d) There was no evidence that by the method of inspection the plaintiff's intestate was required to make he should have discovered the defective condition which caused the explosion, and the fact that the defect was not, in any event, discoverable by inspection, does not relieve the defendant from liability for the death of plaintiff's intestate resulting therefrom, because the defendant was under absolute duty to have the boiler and water glass in safe and proper condition. (*Vide II supra.*)

(e) The law raises a presumption that the plaintiff's intestate discharged the duties imposed upon him and used ordinary care for his safety and protection, and there is no evidence to the contrary.

*W. & G. R. R. Co. vs. Gladmon, 15 Wal. 401.*
*Texas & Pac. R. Co. vs. Gentry, 163 U. S. 353.*

(f) The plaintiff's intestate was paying attention to his duties at Singer Tank a few moments before the explosion and told the fireman Walton that they were making a nice run and would not take on water there. (Record, Page 46.)

## ARGUMENT.

### I.

### A Federal Question Presented.

That the question of the sufficiency of the evidence to support recovery in an action under the *Federal Employers'*

*Liability Act* and *Safety Appliance Acts* is a question of law, involving the construction of the Acts, reviewable by this Court on writ of error, is now so well settled that it is sufficient to merely call the Court's attention to the cases cited under the first head of the Brief of the Argument.

It is likewise well settled that unless both State Courts, Trial and Appellate, agree upon the solution of said question, this Court will review the matter, *de novo*, as was done in *Myers vs. Pittsburg Coal Company, 233 U. S. 184*, the reverse of the practice followed in *Great Northern R. Co. vs. Knapp, 240 U. S. 464*, where it was said that when both State Courts have agreed upon a question of this character, their conclusions will not be disturbed unless plain and palpable error appears.

In the case at bar, the Circuit Court, which heard all the evidence and saw the wrecked crown sheet, entered judgment upon the verdict of the jury in favor of the plaintiff, but this judgment the State Appellate Court, being of opinion that the evidence was not sufficient, reversed and ordered a new trial. The evidence at the second trial being the same, the Circuit Court was bound by the rule of the law of the case to enter a final judgment thereon for defendant. The opinion of the Circuit Court gives this reason for its action. (Record, Page 604.)

## II.

### The Construction of the Federal Boiler Act.

The nature and extent of the duty which the defendant owed to the plaintiff's intestate, A. W. Andrews, depends upon the construction of the Federal Safe Boiler Act. (36 Stat. 913.) The Supreme Court of Appeals of Virginia, reversing the decision and judgment of the Circuit Court in this case, held that the plaintiff could not recover because she had failed to prove *negligence* on the part of the defendant, and that no recovery could be had under said Act except upon proof of *negligence*. (See opinion, Record,

Pages 578-583.) It is respectfully submitted that in thus construing this Act said Court was in error, and that the proper construction thereof is contained in the following statement:—

**The Federal Safe Boiler Act (36 Stat. 913) imposes upon the Railroad Company the absolute duty to have its locomotives equipped with safe and suitable boilers and appurtenances thereto, at all times, while moving interstate traffic.**

This statute is entitled "*An Act to promote the safety of employees and travelers upon railroads by compelling common carriers engaged in interstate commerce to equip their locomotives with safe and suitable boilers and appurtenances thereto.*"

Section 2 of the Act (*U. S. Comp. Stat. Sec. 8631*), provides as follows:—

"*From and after the first day of July, nineteen hundred and eleven, it shall be unlawful for any common carrier, its officers or agents, subject to this Act, to use any locomotive engine propelled by steam power in moving interstate or foreign traffic unless the boiler of said locomotive and appurtenances thereof are in proper condition and safe to operate in the service to which the same is put, that the same may be employed in the active service of such carrier in moving traffic without unnecessary peril to life or limb* * * *.*"

A comparison of the language used in the above title and section with the title and Act of March 2d, 1893, c 196; U. S. Compiled statutes Secs. 8605, 8606, 8608;—commonly known as the Safety Appliance Acts of 1893,—shows that, *mutatis mutandis*, they are the same. It is quite obvious that the author of the Safe Boiler Act had before him the Automatic Coupler Act, or one of those similar thereto, and that by striking out words inappropriate to boilers and substituting appropriate ones, he framed Section 2 of the Act in question.

The original Safety Appliance Act of March 2d, 1893, c. 196, dealt with locomotive power wheel brakes and train brakes; with automatic couplers; with grab irons and hand holds; and with the standard height of drawbars—on all cars *while used in moving interstate traffic.* By the Act of March 2d, 1903, c. 796, the provisions of the above Act were extended so as to apply to all cars and locomotives used on any railroad engaged in interstate commerce. (*U. S. Comp. Stat. Sec. 8613.*) By the Act of April 14th, 1910, the above-mentioned Safety Appliance Acts were supplemented so as to make it unlawful after July 1st, 1911, for any railroad engaged in interstate commerce *to haul on its line* any cars not equipped with secure sill steps, efficient hand brakes, secure ladders and running boards, and secure hand holds and grab irons at the tops of the ladders. (*U. S. Comp. Stat. Sec. 8618.*) By the Act of May 30th, 1908, c. 225, it was made unlawful for any common carrier to use in moving interstate traffic any locomotive not equipped with a certain kind of ash pan. (*U. S. Comp. Stat. Sec. 8624.*) It thus appears that in February, 1911, Congress had enacted safety appliance statutes covering nearly the entire field of railroad equipment except locomotive boilers and their appurtenances and that on February 17th, 1911, the Act here declared on was passed, making it unlawful for the railroad to use a steam locomotive *in moving interstate traffic* unless the boiler and appurtenances are safe.

In construing the earlier Safety Appliance Acts some of the Courts considered that the exercise of due diligence on the part of the railroad to provide and maintain the required instrumentalities was a sufficient compliance, while others held that the duty imposed was an absolute one. These differences of opinion were settled once and for all on May 18th, 1908, when this Court handed down its decision in the Taylor case (210 U. S. 281), holding that the drawbar act imposed an absolute duty on the railroads to have and maintain at all times such appliances as complied with the required standard, and that ignorance of the

defect, or the exercise of the highest degree of care and inspection on the part of the railroad was no defense. In C. B. & Q. R. Co. *vs.* U. S., 220 U. S. 559, the railroads sought to distinguish between the drawbar requirement and the section governing automatic couplers, but this Court reiterated the principles announced in the Taylor case, and said they had been regarded properly by the Courts in general as applicable in the construction of the Automatic Coupler Act. The spirit and purpose of these acts were expressed in the following emphatic language in the last-named case:

> *"If the railroad does, in point of fact, use cars which do not comply with the standard it violates the plain prohibitions of the law, and there arises from that violation the liability to make compensation to one who is injured by it."* * * * * *
>
> *"It is quite conceivable that Congress, contemplating the inevitable hardship of such injuries and hoping to diminish the economic loss to the community resulting from them, should deem it wise to impose their burdens upon those who could measurably control their causes, instead of upon those who are, in the main, helpless in that regard. Such a policy would be intelligible and, to say the least, not so unreasonable as to require us to doubt that it was intended, and to seek some unnatural interpretation of common words. We see no error in this part of the case."*

Referring to the omission of Congress to make knowledge and diligence on the part of the carrier ingredients of the act condemned, it was further said:

> *"Its omission was intentional, in order that this statute might induce such a high degree of care and diligence on the part of the railway company as to necessitate a change in the manner of inspecting appliances, and to protect the lives and safety of its employees, provided the accident occurs from a defective appliance such as is designated in this act."*

It is needless to touch upon the numerous cases decided since the Taylor case in which the principles there enunciated have been repeatedly applied by this and other courts in actions founded upon violation of the coupler act and the drawbar act. The first case, however, which this Court decided applying the same principles to the 1910 amendment relating to the duty to provide secure *hand holds* or *grab irons* was *Texas & Pacific R. Co. vs. Rigsby, 241 U. S. 33.* The railroad seems to have set up the same contention there, *i. e.*, that the plaintiff must prove that the defect in the ladder was due to the railroad's negligence, but this Court said:

> "*The question whether the defective condition of the ladder was due to defendant's negligence is immaterial, since the statute imposes an absolute and unqualified duty to maintain the appliance in secure condition.*"
>
> Citing the Taylor case, among others, as controlling the construction of the hand hold act.

And likewise in the case of *Spokane & I. E. R. Co. vs. Campbell, 241 U. S. 497,* which was based upon an alleged violation of duty to maintain *safe air brakes,* this Court said:

> "*It is insisted that there was no evidence that the provision of the safety appliance act respecting train brakes was violated. It is, of course, settled that if the equipment was in fact defective, or out of repair, the question whether this was attributable to the company's negligence is immaterial.*"

And the same cases are cited as controlling the construction of the air brake act.

In *Baltimore & O. R. Co. vs. Wilson, 242 U. S. 295,* the railroad was held liable for injuries sustained by an employee where the evidence justified the finding of the jury that the violation of the *Hours of Service Act* (*34 Stat. 1415, 1416*) contributed to the injury, and the question whether

the retention of said employee in service for an excessive time was due to the Company's negligence did not even enter into the consideration of the case.

Three years after the opinion in the Taylor case had been handed down and after those principles of construction of the safety appliance statutes had become well settled and grounded into the law of the land, Congress with full knowledge of those decisions, deliberately employed the same language, *mutatis mutandis*, in the Safe Boiler Act.

The Virginia Court of Appeals distinguished the *Boiler Statute* from the other *Safety Appliance Acts*, not because of any difference in the language employed, but because of what the Court considered such a marked difference in the appliances dealt with by the acts that "rules which would be reasonable and appropriate in respect to the one class would be impossible of practical application to the other." The difference indicated, of which judicial cognizance was taken, is that couplers, drawbars, and the like are said not to require attention to keep them in safe condition, whereas the locomotive "calls for the continuous exercise of a high degree of skill and experience and the constant supervision and attention of the engineer." The "difference" is said to *exist*, but the opinion does not give the reason why the necessity to use care and skill in operating should absolve the railroad from the duty to provide a safe boiler and appurtenances.

With the utmost deference for the learned Judge who wrote the opinion, nevertheless, it seems to us that the distinction suggested was one which it was wholly within the province of Congress to consider and is not a question for the Courts. As said by Mr. Justice Moody in the Taylor case, *supra*, the "harshness" of laws "is no concern of the Courts. They have no responsibility for the justice or wisdom of legislation, and no duty except to enforce the law *as it is written*, unless it is clearly beyond the constitutional power of the lawmaking body."

The above distinction made in these statutes by the Court of Appeals appears to us to have resulted from a slight misconception of the construction this Court had placed upon the drawbar act and coupler act in the Taylor case and in C. B. & Q. R. Co. *vs.* United States, *supra*. The Court of Appeals evidently considered that under the two above cases, the railroad had been held to be not only responsible for the safe condition of the drawbar and coupler, but an *insurer of the safety of the employee*. That this is the ground of distinction advanced is indicated by the following language of the opinion of the Court of Appeals:—

> "*When, therefore, the carrier has discharged his statutory duty to the engineer by* **turning over to him** *a locomotive engine and boiler and appurtenances in proper condition and safe to operate,* **it is not answerable to the engineer as insurer of HIS safety throughout the run,** *and in order for his personal representative to maintain an action for his death caused by the explosion of the boiler, the burden rests upon the plaintiff to show that the defendant has been guilty of the* **negligence** *charged in the declaration.*"

The distinction made on account of the difference in character between boiler and water glasses on the one hand and air brakes and automatic couplers on the other applies with much logic to the measure of proof necessary to establish an unsafe condition in the respective appliances, but clearly cannot require the Court to say that a law cannot be passed imposing the duty to provide a safe boiler appliance. True, it is more difficult to prove that exploded locomotive boilers or their appurtenances were unsafe before the explosion than to prove that a hand hold which broke was insecure or a coupler which failed to couple was not in proper condition. *The mere fact of the breaking of the hold* or *the failure of the coupler to couple automatically upon impact, or the parting of the coupler in transit, or the failure of the air brakes to work properly,* have been held by this Court

to be sufficient evidence to establish a violation of the Safety Appliance Acts concerning those appliances.

*Texas & Pac. R. Co. vs. Rigsby, 241 U. S. 33.*
*Chicago, R. I. & P. R. Co. vs. Brown, 229 U. S. 317.*
*San Antonio & A. P. R. Co. vs. Wagner, 241 U. S. 476.*
*Atlantic City R. Co. vs. Parker, 242 U. S. 56.*
*Minneapolis & St. L. R. Co. vs. Gotschall, 244 U. S. 66.*
*Spokane & I. E. R. Co. vs. Campbell, 241 U. S. 497.*

But the fact that the boiler requires attention by the engineer to prevent its exploding is a good and sufficient reason why evidence of the mere fact that it did explode while in his charge should not be sufficient, in and of itself, to prove that the statute has been violated, for, in the absence of evidence as to the circumstances attending the explosion, it may be perhaps as probable that the accident occurred through his lack of attention as that it occurred from an unsafe appliance. Therefore, in an action based upon a violation of this Act, it may be said with a great deal of force that the evidence must go further than in the acts above mentioned and must justify an inference that the explosion was not caused solely by the fault of the engineer but resulted, at least in part, from the unsafe appliance.

But the fact that a locomotive requires the engineer's constant attention is no reason why if he is actually injured or killed because of an unsafe boiler or appurtenance, he or his family should not be compensated, as far as there can be compensation. The same principles of natural justice and public policy apply alike to the engineer as to another injured by a defective coupler. The difficulty in *proving violation* of the duty is no reason why the duty itself should not exist.

A few months before the *Safe Boiler Act* was passed the Senate Judiciary Committee submitted its report on the amendments of 1910 to the *Employers' Liability Act* and the

following purpose of enactments of this nature was stated in the following language:

> *"It was the intention of Congress in the enactment of this law originally, and it may be presumed to be the intention of the present Congress, to shift the burden of the loss, resulting from these casualties from 'those least able to bear it', and place it upon those who can, as said by the Supreme Court in the Taylor case, 'measurably control their causes.'*
>
> *"The passage of the original act and the perfection thereof by the amendments herein proposed, stand forth as a declaration of public policy to radically change as far as congressional power can extend those rules of common law which the President in a recent speech at Chicago characterized as 'unjust.' President Taft in his address at Chicago, September 16th, 1909, referred 'to the continuance of unjust rules of law exempting employers from liability for accidents to laborers'."*

The Committee also quoted with strong approval from President Roosevelt's message to the Sixtieth Congress:

> *"The practice of putting the entire burden of loss of life or limb upon the victim or the victim's family is a form of social injustice in which the United States stands in unenviable prominence. In both our Federal and our State legislation we have, with few exceptions, scarcely gone farther than the repeal of the fellow servant principle of the old law of liability, and in some of our states even this slight modification of a completely outgrown principle has not yet been secured. The legislation of the rest of the world stands out in striking contrast to our backwardness in this respect. Since 1895 practically every country in Europe, together with Great Britain, New Zealand, Australia, British Columbia, and the Cape of Good Hope has enacted legislation embodying in one form or another the complete recognition of the principle which* **places upon the employer the entire trade risk in the various lines of industry."**

In *Binns vs. United States, 194 U. S. 486,* the reports of congressional committees were held to be appropriate sources of information for determining the scope of statutes passed on the strength of them.

The Federal Employers' Liability Act refers expressly to "statutes enacted for the safety of employees," is *in pari materia* with them, and the same spirit must be considered to pervade them all.

This Court referred to the spirit and purpose of the hand hold act in *I. C. R. Co. vs. Williams, 242 U. S. 462,* and said:—

> *"This highly important and humane purpose must not be defeated by finesse of construction such as is pressed upon our attention in the argument of this case."*

The purpose of the *Safety Appliance Acts* has been stated by this Court to be two fold; first, to avoid accidents by stimulating an extraordinarily high degree of care and diligence on the part of the railroads in respect to furnishing and inspecting appliances; and, second, where the accident has actually happened, to transfer the burden of the often overwhelming loss from the shoulders of the injured man or his family to the railroad which is so much more able to bear it; *C. B. & Q. R. Co. vs. United States, 220 U. S. 559.* The purpose is both just and humane. An accident frequently blots out at once the entire support of the laborer and his family, and aside from the loss of life or limb, results in almost inconceivable privation and hardship. The primary purpose is to prevent the occurrence of such catastrophies, the secondary one is to alleviate the suffering if such primary purpose fails.

Experience has shown that these purposes can be accomplished in no other way than by imposing upon the carrier the absolute responsibility for losses suffered from defective machinery—not upon the theory that the carrier has done a conscious wrong, but rather upon the prin-

ciple that the business itself should bear the losses occurring from these causes in the prosecution of that business. Nothing is now better recognized than that the rule requiring the carrier to respond in compensation for only such losses as occurr by reason of its culpability has proven wholly inadequate to meet modern industrial conditions. This is true for many reasons, not one of the least of which is the frequent impossibility of *proving* the carrier's want of diligence. The evidence is largely in the possession of the railroad and long before the injured man has recovered from his hurt or the bereaved family from the shock of its overwhelming loss, experience has shown that the evidence, if any, which might have been at first available is beyond their reach. And when the issue involves a question of whether proper care has been exercised and expert testimony becomes important, it can hardly be said to be an equal contest between the employee and the great facilities of the railroad. From these and numerous other practical difficulties impartial students of the subject are at one in the view that the only rule which can effect a just result is that imposing an absolute duty respecting the safety of appliances which, if defective, would probably cause injury. With this purpose in mind, the Safety Appliance Acts of 1893 were enacted, and having proven effective, have been added to and enlarged as we have heretofore mentioned.

In no other kind of railroad service is there greater difficulty of proving the lack of care respecting the condition of machinery than where a locomotive boiler has exploded. Here the very happening of the accident wipes out the evidence of negligence and enriches the field for expert testimony, based upon the appearance of the wrecked machinery. The automatic coupler, the hand hold, and such appliances may be examined after an accident and their condition ascertained, but after the explosion of a boiler conditions found merely furnish grounds for inference as to the previous condition. The occult nature of the boiler and appurtenances therefore, and the difficulty of obtaining evidence

which would establish the want of care respecting their condition, demonstrate a greater need for legislation imposing the absolute duty to maintain them in safe and proper condition than existed with respect to the appliances covered by the other acts.

But if Section 2 of the *Boiler Act* is not to be construed according to the same principles as the other acts respecting other appliances, what construction can reasonably be given this Statute? The Court of Appeals does not define its conception of the nature of the duty imposed. Are knowledge and lack of diligence to be considered essentials to its violation? In *C. B. & Q. R. Co. vs. United States, supra*, it was said that Congress purposely omitted to make knowledge and diligence ingredients of the act condemned by the *Automatic Coupler Statute*, so as to impose an absolute duty to provide and maintain the appliance in proper condition at all times with the object in mind of necessitating a change in the manner of inspecting appliances. The same omission having been repeated here, three years after the fact of its omission had been finally construed as imposing an absolute duty and as shifting the burden of loss due to the defective appliance from the injured employee, or his family, to the business in which it occurs, *a fortiori*, ought to be given the same effect.

On the other hand, if the injured employee be required to establish that a specific defect existed in the boiler or appurtenances before the beginning of the journey, as our opponents contend, the statute makes no change in the law. The only method by which this previous defect can be shown is by the testimony of some employee who knew of it beforehand; but proof of such previous condition and such knowledge by the employee would have supported a common law action.

The only effective rule that can be applied is that which this Court has already so repeatedly laid down, holding the railroad responsible for all injuries *caused by these defective appliances*, for the plaintiff, in the very nature

of things, cannot show *when* the defect came into existence. And so it has been repeatedly held with reference to violations of the other safety appliance acts that the railroad is liable for personal injuries sustained by an employee within their protection although the defect occurred in transit after the equipment was delivered to the train crew. In *Spokane & I. E. R. Co. vs. Campbell, 241 U. S. 497*, the railroad was held liable solely upon the evidence that the air brakes failed to work properly at the time of the accident, though, as the opinion says:—

> "*It appeared without dispute that it (the equipment) consisted of the Westinghouse standard automatic air brake, such as is in general use throughout the country upon passenger trains. A witness in defendant's employ testified that shortly before Campbell took the train out from Coeur d' Alene on the trip in question he inspected the air brakes and found them in perfect order.*"

In *Grand Trunk W. R. Co. vs. Lindsay, 233 U. S. 42*, the plaintiff's right to recover for violation of the automatic coupler act was upheld in spite of the following language of the opinion:—

> "There was evidence tending to show that the coupler had been inspected shortly before the accident and no defect was discovered by the inspector."

though it was unquestionably out of order *at the time of the accident* on account of a bent pin.

And in *Minneapolis & St. Louis Railroad Company vs. Gotschall, 244 U. S. 66, 37 Sup. Ct. Rep. 598*, recovery was upheld solely upon proof that the coupler between two cars parted while the train was in motion, resulting in the automatic setting of the emergency brakes and the death of a brakeman, who, having been standing on top of one of the cars, was thrown under the wheels by the sudden jerk.

As a matter of practice, it is impossible to prove *when* a defect in one of the appliances which has caused an injury *first came into existence*, and, therefore, no other rule than that applied in the foregoing cases will accomplish the purpose for which the statute was passed. The language of the Act is that unless the boiler and appurtenances *are safe*, it shall be unlawful to use same *in moving interstate traffic*, making it a clear violation of its provisions to use same after the defect comes into existence, whether the defect occurs while *in transit* or existed beforehand. And as to the other safety appliance acts, even after the discovery of the defect, if the car is hauled to the repair shop, while no penalty can be incurred for so doing, nevertheless it is at the carrier's risk *as to accidents to employees. 36 Stat. at Large 299. Great Northern R. Co. vs. Otos, 239 U. S. 349.*

That the Act here under consideration was intended to change the common law duty with respect to providing and maintaining safe locomotive boilers and appurtenances is further evidenced by the fact that in the Act of March 4th, 1915, c. 169, Section 1, Congress provided that,

> *"Section 2 of the Act entitled 'An Act to promote the safety of employees and travelers upon railroads by compelling common carriers engaged in interstate commerce to equip their locomotives with safe and suitable boilers and appurtenances thereto,' approved February 17th, 1911, shall apply to and include the entire locomotive and tender and all parts and appurtenances thereof."*

This language could have been intended to have no other effect than to impose with respect to the safeness of the entire locomotive and tender and all its parts and appurtenances the same absolute duty as that imposed by other acts concerning automatic couplers, drawbars, grab irons, hand holds, ladders, ash pans, and the other appliances dealt with by similar language in the other acts. It was clearly intended to afford to a locomotive engineer whose injury or death may be caused in part by some defect in the loco-

motive, the same protection and redress afforded other employees by the other Safety Appliance Acts.

To sum up on this point,—from the omission of Congress to make knowledge and diligence ingredients of the Act condemned, and from the fact that the language of the Boiler Act is so similar to the other Safety Appliance Acts which have been construed to impose an absolute duty at all times, it seems clear that the same construction must be applied *unless the nature of the boiler and appurtenances is such as would render the Boiler Act unconstitutional if so construed.* But the nature of the appliances, in fact, not only does not prohibit such a construction, but in order to accomplish the general purpose of these statutes, indicates a greater need for it than under the other acts. However, the locomotive, being in charge of the engineer and requiring attention from him to prevent an explosion even when in proper condition, *evidence of the mere fact of an explosion while in charge of the engineer, would seem not to be sufficient* to prove a violation of the duty imposed by the statute for his protection, but the evidence must show that the explosion occurred under such circumstances as that it would not have occurred if the boiler and appurtenances had been safe.

Finally, in view of this Court's previous construction of the similar acts, it is submitted that the rule stated in *Mason vs. Fearson, 9 How. 248, 13 L. Ed. 125,* precludes any other construction for the Boiler Act than that we contend for:

> *"With knowledge of our construction, like words being again repeated by Congress, it may well be considered that a like construction was intended and was expected to be given these words."*
>
> *Logan vs. United States, 144 U. S. 236.*
> *United States vs. Mooney, 116 U. S. 104.*
> *Kepner vs. United States, 195 U. S. 100.*

## III.

### The Rule Applicable for Determining the Sufficiency of the Evidence.

The rule by which the evidence is to be viewed in order to determine the question of its sufficiency to sustain the verdict of the jury upon a demurrer to the evidence under the Virginia practice, is substantially the same as that prevailing in the Federal courts upon a motion to direct a verdict. The Supreme Court of Appeals of Virginia has repeatedly stated the rule in this language:

> *"The demurrant admits the truth of the demurree's evidence, and all just inferences that a jury might properly draw therefrom, and waives all of its own evidence in conflict with that of demurree, and all inference from its own evidence, although not in conflict with the demurree's evidence, which do not necessarily result therefrom."*
>
> *White vs. Am. Nat. L. Ins. Co., 115 Va., at P. 307.*

The admission is, therefore, that the jury has drawn every inference in favor of the demurree, and against the demurrant, and has given full credence to all of demurree's witnesses.

Thus, the question is whether, construing all the evidence in the most favorable aspect possible to the demurree, or plaintiff in error, there is enough to sustain the verdict in her favor.

## IV.

### The Circumstances Under Which the Boiler Exploded Permit an Inference or Finding That it Was Caused Either by an Unsafe Boiler or an Unsafe Water Glass.

It is not disputed that if the boiler exploded when the crown sheet was covered with water, the boiler was unsafe

when the explosion occurred. On the other hand, it is quite obvious that if the explosion occurred because of an absence of water from the crown sheet and at a time when the water glass indicated that there was a sufficient quantity of water in the boiler to cover the crown sheet, then the water glass was not in proper condition. The only question involved under this proposition, therefore, is whether the evidence warranted the jury in finding that the explosion occurred when the water glass indicated that the boiler contained an abundance of water over the crown sheet.

The fireman, Jerry Walton, was the only surviving eyewitness of the explosion. He stated repeatedly that he looked at the water glass just after throwing in some coal as the train was passing Singer Tank, and the water glass registered a half inch from the top. This fact is undisputed. Singer Tank, according to defendant's evidence, is two and a half miles east of where the explosion occurred.

Defendant's witness, Slayton, admitted on cross-examination that when the water stood *one inch* from the top of the water glass the boiler contained 1,296 gallons of water above the point on the crown sheet where the water stood when the crown sheet was overheated, said point being three inches below the top of the crown sheet. The next question, therefore, is whether this 1,296 gallons of water could have been consumed by evaporation in the time required to run the two and one-half miles from Singer Tank to the place where the explosion occurred. The train was running at the rate of eighteen to twenty miles per hour, according to the testimony of fireman Walton, so the time required to run this distance was from seven and one-half to eight and one-third minutes.

According to the testimony of every witness in the case, the engine in question would not consume water at a greater rate than one injector could supply it. There was no dissenting voice as to this fact. It was also shown that the *maximum* capacity of the injector was 116⅔ gal-

lons per minute. If we were to concede that the engine was using as much water as the injector could possibly supply, it still follows that the engine could not have consumed more than from 870 to 967 gallons of the 1,296 gallons which was in the boiler, above the crown sheets burned area, at Singer Tank. But the defendant's Superintendent of Motive Power, Slayton, admitted that this engine would not ordinarily consume more than 100 gallons of water *per minute*. This witness was also forced to admit that the engine could not have used up enough water to expose the crown sheet in the time required to run the two and one-half miles, if the water glass correctly registered an inch from the top at Singer Tank. (Record, Pages 376, 379.)

The average *per mile* consumption of water by this engine between Roanoke and the place of the accident, was shown to be 333⅓ gallons, which would be 833⅓ gallons between Singer Tank and the place where the explosion occurred.

Furthermore, in addition to the fact established as above shown, that the water glass indicated that the boiler contained such a quantity of water at Singer Tank, that it could not have been vaporized so as to permit the crown sheet to become exposed at the time of the explosion, the evidence also shows that the *injector was supplying additional water all the time that the engine was traveling from Singer Tank to the place of the explosion.*

The defendant seeks to escape from the conclusion necessarily following from the above state of facts, by raising the following contention: That the effect, or probative value of the evidence above outlined, as to the quantity of water in the boiler at Singer Tank, the distance from there to the place of the explosion, the speed of the train, and the rate of consumption of water per minute and per mile by the engine which exploded, is completely overcome by an experiment claimed to have been by one

of its engineers, C. L. Richardson, with another engine. Richardson testified to the following facts:

That he ran his engine, No. 479, along the road bed between Singer Tank and the place of the accident, drawing a train of about the same weight as that on which the explosion occurred; that his water glass registered a half an inch to an inch from the top at Singer Tank; that he was making between eighteen and twenty miles per hour; that as an experiment he shut off his injector at Singer Tank to see how fast the water would drop in the glass; that after running two or two and a half miles, the water dropped to one gauge, which he had been told by boilermakers indicated that the boiler contained three inches of water over the crown sheet; that he did not let the water get extremely low or anything like that; that he did not know how much more water the engine would have had to consume to expose the crown sheet, because the water which remained was in the largest part of the boiler, as the boiler tapers smaller at the top; that the place where he again turned on his injector was about a mile east of where *he had been told* the accident happened, and where he had seen indications of cinders and things. (Record, Pages 276, 282, 285.)

The evidence is that when the crown sheet became overheated the water level was three inches *below* the top of the crown sheet, as shown by the marks on the sheet. When Richardson turned on the injector after running two and one-half miles, the water level was at least three inches *above* the top of the crown sheet. Therefore, the boiler of Richardson's engine contained six inches more water in the largest part of the boiler after running two and one-half miles from Singer Tank with the injector shut off, than the Andrews engine contained when it was overheated. Though defendant was in exclusive possession of the drawings and blue prints which would have disclosed how many more gallons of water the engine would have had to consume to reduce the water level to where it stood when the overheating occurred, it did not offer any evidence

upon this point. The presumption is that if this evidence had been favorable it would have been offered. The question, therefore, as to how much longer this quantity of water would have lasted is left to conjecture.

Furthermore, it will be noticed that the witness says he ran two and one-half miles before turning on the injector; but two and one-half miles is the distance from Singer Tank to the place of the explosion; and as the witness said he did not know where the explosion occurred except from what he had been told, and from the fact that he had seen some cinders about a mile west of where he turned on the injector, it appears not improbable that he turned his injector on about the place of the explosion; the best that could be said for his testimony is that his estimates of distance are wholly inaccurate, and, therefore, his testimony is very uncertain.

Construed favorably to the plaintiff in error, as must be done, we do not see how this evidence can shake, in the slightest degree, the probative value of the evidence as to the quantity of water indicated by the water glass to have been in the boiler at Singer Tank, as to the time consumed in traveling the two and one-half miles from there to the place of the explosion, and as to the per minute and per mile consumption of water by the engine which exploded.

But the defendant in error is confronted with the further difficulty that even if the quantity of water indicated by the water glass to have been in the boiler at Singer Tank could have been consumed by the engine in traveling the two and one-half miles to the place of the explosion, so as to expose the crown sheet, *still the evidence shows that the injector was in the meantime supplying the boiler with additional water.*

The defendant in error seeks to avoid the effect of this evidence, by saying that the fireman, who testified to said fact, was so ignorant as to the injector that he could not

tell whether it was working properly or not, and that his evidence cannot be given credence and is of no weight.

But in this contention the defendant is clearly in error.

**The evidence is sufficient to warrant the jury in finding that the injector was properly working and forcing water into the boiler in traveling between Singer Tank and the place where the explosion occurred.**

The fireman, Walton, testified that the engineer, Andrews, turned on the right injector when the train left Roanoke, and that it remained on until the explosion occurred; that if the injector is working properly and forcing the water into the boiler it makes a solid sound, while if not putting water into the boiler it makes a steam noise. That he noticed especially when he was firing the engine at Singer Tank and when firing a few seconds before the explosion, that it was making the solid sound. (Record, Pages 45, 46, 47, 48.) He stated further that he could tell from the sound of the water going through the pipe whether the injector was working or not, and that it is an easy matter to tell. (Record, Page 46.)

The defendant's witness, Neece, a hostler, stated that one can always tell whether the injector is working by the sound; that when working it gives forth a ringing sound, while if it is not working, it makes "*a blowing sound, it don't have any sound at all, you can hear it blowing.*" (Record, Page 243.)

The Interstate Commerce inspector, Pfahler, defendant's witness, said that an engineer can sit in his cab and tell instantly if the injector of the type in question fails to work properly, and that it makes no difference whether it is dark or not. (Record, Page 431.)

F. A. Richardson, an engineer of many years experience, and who was in defendant's employ at the time he was testifying, said that a fireman had no trouble in telling from the difference in sound whether or not the injector is throwing water into the boiler; that this is the first

thing a fireman learns. (Record, Pages 71, 72.) He stated again, on cross-examination, that a fireman can tell, *by listening*, whether the injector is properly throwing water into the boiler, but that a man who was not familiar with that type of injector and engine could not tell "*right at first*," but he would have to have *some* familiarity with the engine and injector; that the sound is easily audible in the cab, and this would not be affected by the cab window being closed, because the sound comes up from between the engine and tender. (Record, Page 75.)

The said witness, Walton, who was fireman at the time of the explosion, and testified that he knew from the sound the injector made that it was kept constantly working properly after leaving Roanoke, had had quite considerable experience as fireman, having held that position for eighteen months prior to the accident. While he was not very familiar with the type of engine which exploded, yet he said he had previously fired for other engineers on engines of the same class and kind. (Record, Page 54.) He said he would not be positive (it had been about two years since he had been on the engine), but thought the injector and pipes were situated inside the engine cab *because he could hear the injector working.* When asked as to the location of the pipes with respect to the cab, he said "it runs on the inside, *I suppose; you can hear it.*"

Defendant's contention is that because the witness was not very familiar with the type of engine which exploded, and could not remember two years later the details of construction of the engine, and the location of the injector and pipes leading from the injector to the boiler, that therefore the Court should say as a matter of law, that his testimony that he heard the injector make the characteristic sound of a working injector, is not sufficient proof of what he testifies to. This contention loses sight of the fact established by three other witnesses (two of them defendant's), that the fireman while in the cab could easily hear the injector, and that the sounds given forth when working and not working,

respectively, were as described by Walton. The point is, *Could he hear it working?* If he could, it is immaterial that he did not remember two years later that the injector on the engine which exploded did not occupy the same position as that on the old type upon which he had previously fired. One may very easily remember that two years ago he heard a clock strike a certain hour when a particular event was transpiring, and still not be able to recall the slightest memory of where the clock sat, or whether it was in the room with him or in an adjoining room or hall. His credibility would obviously depend upon whether he was within hearing distance of the clock, not upon whether he could recall where it was located.

Walton's statement that he was within hearing of the injector and could tell by the sound whether it was working, and also his statement as to the manner of distinguishing between the respective sounds when working and not working, having been corroborated by three other reliable witnesses, it seems clear that his testimony on this subject should be taken to establish the fact that while the train was traveling between Singer Tank and the place of the accident, the right injector was working properly and forcing water into the boiler.

The testimony of the fireman as to the registration of the water glass at Singer Tank, the continuous working of the injector, and the speed of the train between Singer Tank and the place of the accident, the undisputed evidence as to the quantity of water in the boiler above the overheated part of the crown sheet, and as to the distance from Singer Tank to the place of the accident, and as to the per minute and per mile consumption of water by the engine, raise an undisputable inference that the explosion resulted either from an unsafe boiler or an unsafe water glass.

This inference the defendant contends is overcome by its evidence as to certain alleged inspections of the boiler and water glass, but this contention is clearly untenable.

**Evidence that the boiler and water glass had been properly inspected before the beginning of the trip, and no defect discovered, is not conclusive evidence that said appliances were in fact in safe and proper condition, where the circumstances under which the explosion occurred show that either said boiler or said water glass was not in proper condition.**

The defendant introduced evidence as to certain tests given the material of which the stay bolts were constructed, while the engine was being built, which was in substance as follows:

The witness, B. O. Yearwood, testified that he witnessed the tests of the stay bolt material, which were conducted at the Baldwin Locomotive Works, before the boiler was built. That that material when in the rolling mill, before arriving at the locomotive works, was in the form of a square billet of iron. From this billet about sixteen to twenty bars, approximately sixteen feet in length, were rolled and placed in a bundle, with a serial number stamped on them for identification. This bundle was termed a "heat" and the only test which was conducted was to select a specimen piece, about one foot in length, from one of the bars, and ascertain the tensile strength of this particular foot. If the result was satisfactory, the entire bundle was accepted. The witness admitted that he had no personal knowledge that all the bars in the same bundle were rolled from the same billet, but the rolling mill was relied on to adhere to the customary practice in this respect.

The witness, J. C. Shinn, was the employee of the Baldwin Locomotive Works in connection with the same tests. His testimony was substantially the same as that of Yearwood. He admitted that the material used in the test represented less than one per cent. of that which was used for the stay bolts in building the boiler; that he did not know what per cent. test was generally required by other railroads; that he was only twenty-one years of age, and that he began testing material only a few months before the time these tests were conducted. It was further ad-

mitted by the witness that he did not know what became of the material after he tested it; that he had no personal knowledge whatsoever that it was actually used in the boiler in question.

With reference to these tests, it is obvious that no *necessary* inference follows from them that all the material used in making the stay bolts was of the specified strength. If by any mischance the test was reported as made when it was not, or if the workman was careless in his work—for it is human to err—or if the foot of iron used in the test chanced not to be a true and correct representative of the other three hundred feet of the supposed heat, or if the material thus tested was not actually used in the boiler, any one of which things might easily have happened, and still the testimony be true, the bolts in a large part of the boiler would probably be far below the strength required in the specifications. While the evidence may have indicated that the defendant used reasonable care in this respect, it is by no means conclusive that the iron was of the quality specified.

The witness, Bowden, defendant's employee, testified that he supervised the building of the ten locomotives of which 469 was one, and so far as he could tell, the work was well done. He actually saw a very small part of it while it was being done. After the boiler was completed, it was subjected to a water pressure of 285 pounds to the square inch, or 4,560 pounds to the bolt (about one-tenth of the holding power designated in the specifications) and also to a steam test of 220 or 240 pounds. Neither of these tests were much in excess of the ordinary boiler pressure.

The next witness, John Schaefer, of the Baldwin Locomotive Works, described the water test, which he said he conducted and preserved written memoranda of, and said that 267 pounds to the square inch was the pressure used, instead of 285, as indicated by Bowden; and James Reed, who conducted the steam test, said only 220 pounds was

the pressure used for that test. These tests only subjected the stay bolt material to a strain of about 4,000 pounds, and may be said to show that when the engine was built it was able to withstand that pressure.

The witnesses also stated that after the boiler was completed, it was "cooked" out with soda so as to remove all accumulations off the crown sheet. The only pertinent fact that the defendant can claim is to be *necessarily* inferred from the foregoing testimony, is that the stay bolts were able to withstand a strain of 4,272 pounds at the time the engine was built. (16x267 4,272.) So much for the tests applied while the engine was being built.

**Next, as to the inspections conducted after the engine was put into service.** It was shown that the Government regulations require the bolts to be inspected by the "hammer test" once a month. This consists in striking the bolt head with a hammer and judging from the sound and resiliency whether it is broken or not. The Company required the engineer to look into the fire box door before and at the end of each run to try to discover leaks, and the hostlers to make a similar examination between trips. Slayton testified that the boilermakers were required to go into the fire box between trips when the fire was out, and inspect. The only inspections actually shown to have been made of the engine after it was built were the following:

(1) The defendant's employee, Funk, who did not claim to be an expert, and had not served his boilermaker apprenticeship, made the monthly hammer inspection required by the government regulations on November 11th, four days before the explosion. He says he found everything in good condition; that there were no pockets in the crown sheet at that time, but that he did not look inside the boiler. The bolts were not subjected to any test at that time to determine their holding power, and the utmost that can be said to be established by the inspection, if full credence be given the witness, is that, so far as he could tell, none of the stay bolts were broken at that time, and

the crown sheet had not been pocketed between the bolts as it was after the explosion. He also said the water glass was in proper condition at that time.

(2) The hostler, Whitesell, testified that he took charge of the engine when Andrews brought it in on the morning of the 14th of November, the morning preceding the night of the explosion, and that so far as he could see there were no pockets in the crown sheet, and it was all right. He stated that the fire was kept in the engine all day, and did not claim that such an inspection as he made would have resulted in the discovery of the pockets in the crown sheet. He further testified, on cross-examination, that he had charge of handling some seven or eight engines that day, all of which had fire in them, but that he did not try to keep watch on them, as he didn't attend to the fire and water; that this was Monk Vaughn's duty, he being the fire and water man; that the witness had nothing to do with the fire and water, and did not watch that at all; and that he would not positively say that the water did not get low while he was away from it; that the water has to be renewed in the engines standing in the roundhouse five or six times a day; that the steam pressure is kept low, about 120 to 140 pounds, in the roundhouse. He said further that he examined the water glass and found it "open." As to what kind of examination he made of the water glass, his testimony is silent. There is no evidence that he cleaned out the openings, or that they were free from deposits. When the witness was testifying, it had been two years since the accident, and he admitted finally that he did not remember what happened this day any more than any other day, and that his testimony was given upon the assumption that he did the same thing every day.

As to this witness' testimony, viewed under the demurrer, it seems to have little, if any, probative value. His testimony shows that he did not remember whether he examined the crown sheet or water glass of engine 469, or whether he even handled the engine at all on the day in

question. Certainly, no inference can be drawn from it that the crown sheet was not then pocketed, or that the water glass was clean and free from deposits.

(3) The hostler, Neece, testified that he came on duty at eight o'clock on the night of the accident. That he inspected the crown sheet by looking inside the fire box door when there was a fire in the engine; that he put some oil on a rag and made a torch which he used to enable him to see the crown sheet up in the forward end over the brick arch, and the crown sheet was not leaking at that time; that it was not his duty to make such an inspection, but—to quote the witness—"we had had so much trouble with fellows claiming we had burned engines around there, that was the reason I done that." He did not claim, however, that the slight pockets between the bolts in the crown sheet could be seen by this method of inspection, even when aided by a torch. These questions and answers are found in his testimony on Page 239 of the Record:

> "*Q. Then by the aid of that light, was that light enough for you to see that crown sheet?*
>
> "*A. Yes, sir.*
>
> "*Q. And notwithstanding the fact that you could see the crown sheet, you refuse to state that there were no buckles in it; that is true, isn't it?*
>
> "*A. Yes, sir.*"

He also said he "tried" the water glass and it was "o. k." From the shifting manner of this witness, it is very doubtful if he ever did what he claims. The Superintendent of Motive Power said it was not his duty to do it, and if he did do it, it was wholly voluntary. (Record, Page 481.) But conceding that he did, the inference is not even permissible, much the less necessary, that the crown sheet had not been overheated previous to his inspection. The utmost that can be inferred is that it was not then leaking, and this the plaintiff does not dispute. Defendant's witness, C. L. Richard-

son, admitted that the slight pockets found in the crown sheet after the explosion would not be revealed by such an examination as Neece and Whitesell claim to have made, and his testimony on this point is not disputed. As to the water glass, clearly his statement that he "tried" it is not conclusive that it was then clean and free from deposits.

(4) The only other inspections that defendant claims the crown sheet received were those made by the plaintiff's intestate himself. These inspections, if they can be so called, consisted merely in looking inside the fire box with a fire in the engine. Leaks in the crown bolts might be discovered in this way, though not when the engine was hot, unless leaking very badly. The buckles or pockets in the crown sheet between the bolts cannot be discovered by this method of inspection. The engineer was required to thus look into the engine before and after every trip, and at the end of every trip make a written report as to the condition of his engine. The decedent completed three trips on this engine after the monthly inspection, which was made on November 11th, and, therefore, he made three written reports to the defendant as to the engine's condition. The two reports which were made on November 13th and November 14th, respectively, were introduced in evidence by the defendant, *but it is significant that it did not produce the one made at Roanoke on the morning of November 12th.* (Record, Page 251.) The evidence further shows that this engine made a trip from Princeton to Roanoke on November 9th, *on which Massie was the engineer*, and that the engine lost four hours and fifty minutes in a ten-hour run trying to get up steam. (Record, Pages 257, 259.) The trip made by Andrews from Princeton to Roanoke on the night of the 11th, just after Funk had completed his inspection, was necessarily the next trip the engine made after Massie had his trouble. The other two reports were regarded as sufficiently important to bring the witness, W. R Moore, from Princeton, West Virginia, to Christiansburg, Virginia, for no other purpose than to prove by him the

identity of the report made on the 13th by the decedent, and the witness, Pharr, from Roanoke, to identify that of the 14th, *yet not a word is said about what condition he reported the engine in on arriving at Roanoke the morning of November 12th.* The witness, Scott, testified that he saw the decedent look into the fire box door at his crown sheet before beginning the run on the night of the accident, showing that he performed the duty required of him.

The testimony of the defendant, viewed on the demurrer, even conceding the credibility of the witnesses, cannot be said to prove more than the following:

(1) That the stay bolts of the boiler when built were able to withstand a strain of at least 4,272 pounds, when the engine was first built.

(2) That the crown sheet had not been pocketed on November 11th, 1912, when inspected by Funk.

The foregoing, then, constitutes the evidence as to the "inspections" upon which the defendant in error relies to overcome the unavoidable inference arising from the circumstances under which the explosion occurred. What, then, is the legal effect of this evidence as to inspections and what weight has been accorded such evidence by this Court in actions under the Safety Appliance Statutes?

The case of *Spokane & I. E. R. Co. vs. Campbell, 241 U. S. 497*, seems conclusive upon this point. The plaintiff, Campbell, was the motorman in charge of a special train running between Spokane and Coeur d'Alene. Having, in violation of his orders, run by the point where he should have met Train No. 20, and while running about thirty miles an hour, he saw Train No. 20 about 800 feet away, approaching from the opposite direction, and realized that a head on collision was imminent. He immediately shut off the power and threw on the emergency air brake to the full capacity. The brakes took hold properly and held for thirty-five or forty feet, when the air released or "leaked off" and after that there was nothing he could successfully do to stop the train. From these circumstances, the jury found "that

the air brakes on Campbell's train *immediately before the collision* were insufficient to enable him to control the speed of the train." The defendant contended, however, that the evidence as to inspections which had been made of the air brakes a very short time theretofore, showed that they were not defective, and that this evidence should be held to overcome the inferences arising from the evidence as to the circumstances showing that the brakes would not work properly. Upon this subject the Court said:

> "*It is insisted that there was no evidence that the provision of the Safety Appliance Act respecting train brakes was violated. It is, of course, settled, that if the equipment was in fact defective or out of repair, the question whether this was attributable to the company's negligence is immaterial. (Citing cases.) Hence the argument is that, according to all of the evidence, the equipment was not defective or out of repair. It appeared without dispute that it consisted of the Westinghouse standard automatic air brake, such as in general use throughout the country upon passenger trains. A witness in defendant's employ testified that shortly before Campbell took the train out from Coeur d'Alene on the trip in question he inspected the air brakes and found them in perfect order. But there was much evidence besides that of Campbell himself, to the effect that when he applied the emergency the brakes took hold and then leaked off so as to release the brakes. The jury was warranted in finding from the testimony as a whole that Campbell properly applied the air when 600 feet or more from the place where the collision occurred and that the brakes refused to work. Expert witnesses called by defendant, testified in effect that the train could have been stopped inside of 300 feet if the brakes had been in proper order.* **The air brake equipment was wrecked in the collision, so that there was no explanation of the cause of its failure to operate properly; but it was a reasonable inference that there was some defect or want of repair in the valve or packing."**

*Grand Trunk W. R. Co. vs. Lindsay, 233 U. S. 42,* was an action to recover for injuries sustained by one of a switching crew in endeavoring, by going in between the cars, to effect a coupling where the cars failed to couple automatically upon impact. The defendant relied upon previous inspections to establish the fact that the coupler was not defective, but this Court affirmed a judgment in favor of the employee upon evidence as to the condition of the coupler at the time of the accident. It was said in the opinion:

> *"There was evidence tending to show that the coupler had been inspected shortly before the accident and no defect was observed by the inspector, but it was shown without dispute that it was defective at the time of the accident, and would not couple because of a bent pin."*

It seems clear from the two above decisions that evidence as to inspections is probative only of the fact that *no defect was discovered*, and where controverted by other evidence, or by inferences from the circumstances under which the accident happens, is not sufficient to compel the finding that the appliance was, in fact, in proper condition.

V.

IF THE EVIDENCE AS TO THE CIRCUMSTANCES UNDER WHICH THE EXPLOSION OCCURRED WARRANTED THE JURY IN FINDING THAT THE DEATH OF PLAINTIFF'S INTESTATE WAS CAUSED WHOLLY OR IN PART BY EITHER AN UNSAFE BOILER OR AN UNSAFE WATER GLASS, THAT IS ALL THAT IS NECESSARY TO ENTITLE PLAINTIFF TO RECOVER UNDER THE FEDERAL SAFE BOILER ACT, THE RULE OF RES IPSA LOQUITUR BEING APPLICABLE.

In *Spokane & I. E. R. Co. vs. Campbell, 241 U. S. 497,* Mr. Justice Pitney, speaking for the Court, used this language:—

*"Upon the whole case, we have no difficulty in sustaining his right of action under the Employers' Liability Act. That Act (81, 35 Stat. at L, 65, Chap. 149, Comp. Stat. 1913, Sec. 8657) imposes a liability for injury to an employee resulting* **in whole or in part** *from the negligence of any of the officers, agents, or employees of such carrier, or by reason of any defect or insufficiency due to its negligence in its cars, engines, appliances * * * * or other equipment. As was held in San Antonio & A. Pass. R. Co. vs. Wagner, 241 U. S. 476, a violation of the Safety Appliance Act is "negligence" within the meaning of the liability act. And by the proviso to Sec. 3 of the latter act, no employee injured or killed shall be held to have been guilty of contributory negligence in any case where a violation of the Safety Appliance Act* **'contributed** *to the injury or death of such employee.' It is too plain for argument that under this legislation the violation of the Safety Appliance Act need not be the* **sole efficient cause,** *in order that an action may lie. The Circuit Court of Appeals held that the element of proximate cause is eliminated where concurring acts of the employer and employee contribute to the injury or death of the employee. We agree with this, except that we find it unnecessary to say the effect of the statute is wholly to eliminate the question of proximate cause. But where, as in this case, plaintiff's contributory negligence and defendant's violation of a provision of the Safety Appliance Act are concurring proximate causes, it is plain that the Employers' Liability Act requires the former to be disregarded."*

In the case at bar the boiler was wrecked by the violence of the explosion and conditions found afterwards, judging from the conflicting views entertained by the expert witnesses, cannot afford an entirely satisfactory explanation of the cause of the explosion. The circumstances under which the explosion occurred, therefore, must necessarily be the most reliable evidence as to its cause. These circumstances point conclusively to the fact that it was due either to an unsafe water glass or an unsafe boiler, for either of which the defendant is responsible. It is true the plaintiff cannot lay

finger upon the precise cause. In the nature of things this must be impossible, and the law does not require the impossible, but only the highest degree of proof of which the case is susceptible, or that can reasonably be made. The general rule applicable is thus stated in *Shearman and Redfield on Negligence* (Sixth Edition), Pages 127, 130:—

> "*The plaintiff is not bound to prove more than enough to raise a fair presumption of negligence on the part of the defendant and of resulting injury to himself. Having done this, he is entitled to recover, unless the defendant produces evidence sufficient to rebut this presumption. It has sometimes been held not sufficient for the plaintiff to establish a probability of the defendant's fault; but this is going too far. If the facts proved make it probable that the defendant violated his duty, it is for the jury to decide whether he did so or not. To hold otherwise would be to deny the value of circumstantial evidence. As already stated the plaintiff is not bound to prove his case beyond a reasonable doubt, and, although the facts shown must be more consistent with the negligence of the defendant than with the absence of it,* **they need not be inconsistent with any other hypothesis."**

In *Spokane & I. E. R. Co. vs. Campbell, 241 U. S. 497*, the Court spoke as follows upon the question whether the evidence justified a finding that the air brake was defective:

> "*The air brake equipment was wrecked in the collision, so that there was no explanation of the cause of its failure to operate properly;* but it was a reasonable inference that there was some defect or want of repair in the valves or packing."

In *Minneapolis & St. L. R. Co. vs. Gotschall, 244 U. S. 66*, the action was to recover for the death of a brakeman while engaged in interstate commerce. The following quotation from the opinion shows the evidence upon which the right to recover was upheld.

> "*The evidence tended to show the following facts: Gotschall, a minor, twenty years old, at the time in*

*question was head brakeman on an extra freight train running from Albert Lea, Minnesota, to Minneapolis, and transporting interstate commerce merchandise. As the train left Jordan, an intermediate station, Gotschall boarded a car toward the rear end and was proceeding along the tops of the cars toward the locomotive when the train separated because of the opening of a coupler on one of the cars, resulting in an automatic setting of the emergency brakes and a sudden jerk, which threw Gotschall off the train and under the wheels.*

*The jury, under an instruction of the Court, was permitted to infer negligence on the part of the Company from the fact that the coupler failed to perform its function, there being no other proof of negligence. It is insisted that this was error, since, as there was no other evidence of negligence on the part of the Company, the instruction of the Court was erroneous, as, from whatever point of view looked at, it was but an application of the principle designated as* **res ipsa loquitur,** *a doctrine the unsoundness of which, it is said, plainly results from the decisions in Patton vs. Texas & P. R. Co., 179 U. S. 658, 45 L. Ed. 361; 21 Sup. Ct. Rep. 275, and Looney vs. Metropolitan R. Co., 200 U. S. 480, 59 L. Ed. 564, 26 Sup. Ct. Rep. 303, 19 Am. Neg. Rep. 627. We think the contention is without merit because, conceding in the fullest measure the correctness of the ruling announced in the cases relied upon to the effect that negligence may not be inferred from the mere happening of an accident except under the most exceptional circumstances,* **we are of opinion such principle is here not controlling in view of the positive duty imposed by the statute upon the railroad to furnish safe appliances for the coupling of cars."**

The case of *Myers vs. Pittsburgh Coal Company, 233 U. S. 184*, is also authority for the fact that where the case is one of circumstantial evidence, the plaintiff is not required to point out the specific cause of the accident.

Plaintiff's intestate in that case was employed to keep his position on the rear end of the rear car of a train operated in the underground galleries of a mine; the cars were drawn

by a motor which disconnected from the train, ran forward upon a switch which closed to let the train pass, and when the train had passed, the motor followed up the cars. The power was supplied to the motor by means of an overhead wire charged with a current of electricity sufficient for that purpose, which was five feet seven inches above the surface of the ground upon which the tracks were laid. The deceased signalled with his cap, which was equipped with a light; otherwise the passage in which the cars ran was dark. The motor was not equipped with a headlight and when it followed behind the train it had just been hauling, it ran upon the body of the deceased who was alive at the time he was taken from the spot at which the motor ran upon him. His cap, with the lamp upright and burning was found on the floor of the gallery by the side of the track near where the body lay. When last seen alive, a few moments before, the deceased was occupying his position at the rear end of the train making signals to control the movement of the train. There was no eye-witness to the circumstances which caused his death and no other explanation of the cause thereof than may be inferred from the above statement of facts. From this statement of facts, the plaintiff deduced that decedent came in contact with the trolley wire and by means of such contact received an electric shock which disabled him but did not kill him, and that while in that disabled condition he was run upon by the motor; and that defendant was guilty of negligence in placing the wire at such a low elevation from the ground or the cars that the decedent and others similarly employed might come in contact with it and thereby sustain injury. The Trial Court permitted the case to go to the jury and the jury found a verdict for the plaintiff upon which judgment was entered and the defendant sued out a writ of error to the Circuit Court of Appeals, 3d Circuit. That court reversed the judgment upon the ground that the evidence supported other theories as to the cause of decedent's death upon which defendant would not be liable

of equal probability with the theory upon which the Trial Court had held the defendant liable. A writ of *certiorari* was allowed by this Court and this Court reversed the judgment of the Court of Appeals and affirmed the judgment of the Trial Court. This Court said:

> *"The opinion of the Circuit Court of Appeals placed the reversal largely upon the want of definite proof as to the manner in which Myers came to his death, whether by contact with the wires, or, if so, whether that merely disabled him or he was only injured or stunned by the fall, was seized with vertigo or other sudden sickness and fell from the car for that reason, or lost his footing by some unexpected movement of the train, or voluntarily got off the car and stumbled and fell upon the track, or became bewildered in the dark, and mistakenly supposed himself to be in a place of safety. The Court held that all of these situations were more or less probable, and in the absence of some more accurate means of ascertaining the true condition in this regard, no recovery could be had for wrongful causing of his death, and that an examination of the testimony brought the Court to the conclusion that the jury should not have been permitted to guess as to the proximate cause of death. This question, however, was submitted to the jury and found against the defendant in the Trial Court.* **Unless the testimony was such that no recovery can be had upon the facts shown in any view which can be properly taken of them,** *the verdict and judgment of the District Court must be affirmed."*
>
> *"That there was ample testimony to carry the question of negligence to the jury we have already said, and in any case, it cannot be said as a matter of law that there was no evidence tending to show that Myers came to his death by negligence of the defendant in one or more of the ways charged in the petition. Considering the testimony, as it must be considered in determining questions of this character in Appellate Courts, in its most favorable aspect ot the plaintiff below, we think the jury might well have found, in view of the place at which the body of Myers was found near to the wire, with his cap gone from his*

*head, that he came in contact with that wire and was thrown to the ground and that he survived from the contact with the wire, carrying the voltage which it did, and while in this situation, was run over and killed by the approaching motor car, the operator being unable to see his body from the track because of the want of efficient light in the entry or in the motor car. We think reasonable men, considering the testimony adduced, might well have come to this conclusion, and that it was error in the Appellate Court to set aside the verdict for entire absence of testimony upon this subject. In our opinion, the Trial Court properly left the question to the jury upon testimony which, when fairly considered, might sustain the verdict." (Pages 192-3.)*

It seems well established by the foregoing decisions of this Court that if an injury is sustained under circumstances indicating that said injury was caused by a defect in an appliance required by one of the Safety Appliance Acts to be in safe and proper condition, the plaintiff is not required to show what the particular defect was, but it is sufficient if the evidence, viewed in the most favorable light for the plaintiff, justifies the inference that said appliance failed to perform the function required of it.

To the same effect, in an action under the common law, is the decision in the case of Souden *vs.* Fore River Shipbuilding Co. (Mass.), 112, N. E. 82, which was an action to recover for injuries from the explosion of the boiler of a ship. The plaintiff claimed that the circumstances under which the explosion occurred indicated that it was due to one of two causes; that either the water got low because of the failure of the feed pump to properly supply the boiler, or else the fuel oil did not spray properly from the nozzle, and impinged on one point on the tube, causing overheating, bulging and rupture. The defense was made that the plaintiff must prove specifically what caused the explosion and that the state of the evidence left the matter

to conjecture. But the Court held otherwise and in its opinion, goes on to say:

> *"The fact that the explosion occurred while the boiler was subject to the use for which it was designed, is,* **of itself,** *evidence of a defective condition. Cleary vs. Cavanaugh, 219 Mass. 281, 106 N. E. 998; Sullivan vs. Reed Foundry Co., 207 Mass. 280, 93 N. E. 576; Minihan vs. Boston Elev. Ry. Co., 197 Mass. 367; 83 N. E. 871. While the plaintiff was bound to offer evidence to show that the explosion was caused by the defendant's negligence, he was not required to point out the particular act or omission which caused the accident."* (*Citing cases.*)

The foregoing authorities seem to us to clearly sustain our position upon this point, but if the Court should be of the opinion (which we trust it will not), that the evidence as to the circumstances under which this boiler exploded is not sufficient, standing alone, to support the plaintiff's verdict, then we respectfully submit that the law and evidence in this record, supports the following proposition.

## VI.

THE EVIDENCE AS TO THE CIRCUMSTANCES ATTENDING THE EXPLOSION, COUPLED WITH THE TESTIMONY OF THE PLAINTIFF'S EXPERT WITNESSES AS TO INFERENCES TO BE DRAWN FROM THE APPEARANCE OF THE WRECKED CROWN SHEET AND BOLT HEADS WHICH THEY EXAMINED, SUPPORTS A FINDING BY THE JURY THAT THE EXPLOSION RESULTED FROM AN UNSAFE BOILER, AND THAT THE SAID UNSAFENESS EXISTED WHEN THE ENGINE WAS DELIVERED TO THE PLAINTIFF'S INTESTATE AT ROANOKE.

It will not be necessary to again consider in detail the evidence as to the quantity of water shown by the water glass at Singer Tank and the impossibility of its being consumed in the few minutes which elapsed thereafter before the explosion occurred. We hope we have demon-

strated that the evidence clearly establishes these facts in our discussion under point IV, *supra*. We also discussed there the question of the fireman's ability to tell whether the injector was properly working, and also the inspections which certain of defendant's employees claim to have conducted, and have called the Court's attention to the fact that said inspections, so far as the crown sheet is concerned, consisted in merely looking inside the fire box door when there was a fire in the fire box, and that defendant's employees admitted that they could not tell by such an inspection whether the crown sheet had been previously overheated or not. This, of course, does not apply to the inspection which the witness Funk claimed to have conducted on November 11th, three days before the explosion, but even if this be taken as establishing the fact testified to,—that the crown sheet had not then been overheated—it by no means negatives the possibility that it was overheated after that inspection. A number of witnesses testified that many engines are at all times in service with overheated and pocketed crown sheets. After the inspection of November 11th, the engine was in charge of plaintiff's intestate, Andrews, about half the time, while the other half of the time it was in charge of round house employees in the yards. The evidence clearly does not negative the possibility that the engine may have been overheated in the yards after November 11th, and the leaks, if any developed therefrom, secretly removed by calking at the instance of, or by, the employee through whose fault the overheating occurred. The expert evidence introduced by the plaintiff was to the effect that the crown sheet's appearance indicated that it had been overheated on some occasion prior to the explosion. While there was conflicting evidence offered by the defendants, as the case is here on demurrer to the evidence, the testimony of plaintiff's witnesses must be accepted as true. Their testimony was to the effect that the crown sheet had never been heated sufficiently hot to cause a failure of the bolts, because if it had been, the color of the sheet would have been red and the

surface would have been rough, whereas it was a steely blue and perfectly smooth. Furthermore, the mill scale, which the sheet acquired when it was rolled, was still present; whereas, if it had been heated sufficiently hot to cause sound bolts to break, this mill scale would have been destroyed. They also testified that a number of bolts in the higher part of the crown sheet which would have been first exposed by low water and longer exposed to the heat than those lower down in the sheet, had held out and had not broken, whereas others lower down in the sheet had broken. Also, one-fourth of the broken bolt heads produced by the defendant as having come out of the wreck showed that a part of the fracture occurred while the bolts were hot, and that a part of the broken surface had never been heated above the ordinary boiler temperature. That part of the surface of the broken bolts which had been heated was blue in color, like the surface of the crown sheet, while the other part was bright, indicating a cold break. If this bright part had ever been heated it would have turned blue.

For the above reasons, and from the general appearance and shape of the blown-down crown sheet, and from the fact that it was not anywhere torn, and from other minor indications, plaintiff's expert witnesses were of the opinion that the sheet was not hot when the explosion occurred, and that the explosion resulted from other causes.

This expert testimony was corroborated by the testimony of the fireman as to the registrations of the water glass indicating that the boiler exploded when it was full of water, as said fireman told defendant's witness, Scott, immediately after the explosion.

While the evidence of defendant as to inspections and examinations of the water glass would not compel the jury to find that it was in safe and proper condition, it would permit such a finding.

For these reasons, therefore, it is respectfully submitted that the evidence is sufficient, upon this phase of the case, to support a finding by the jury that the crown sheet and

bolts had been overheated before the engine was delivered to the plaintiff's intestate at Roanoke, and that the boiler exploded when there was ample water present to prevent overheating, and that said boiler was then unsafe and not in proper condition.

If the Court should hold against us on this point, however, and should be of opinion that the evidence compels a finding that the explosion was caused by low water, then, we respectfully submit that the evidence sustains the plaintiff in error's right to recover upon the following proposition:

## VII.

THE EVIDENCE AS TO THE CIRCUMSTANCES ATTENDING THE EXPLOSION, TAKEN IN CONNECTION WITH THE TESTIMONY OF DEFENDANT'S EXPERT WITNESSES THAT THE INFERENCES TO BE DRAWN FROM THE EXPLODED CROWN SHEET AND BROKEN BOLT HEADS SHOWED THAT THE EXPLOSION WAS DUE TO LOW WATER, SUPPORT A FINDING BY THE JURY THAT THE EXPLOSION WAS CAUSED, EITHER WHOLLY OR IN PART, BY AN UNSAFE WATER GLASS, AND THAT SAID UNSAFENESS EXISTED WHEN THE ENGINE WAS DELIVERED TO PLAINTIFF'S INTESTATE AT THE BEGINNING OF THE TRIP.

In our argument under point IV, *supra*, we have already shown that a few minutes before the explosion, while the train was passing Singer Tank, the water glass indicated that the boiler contained so great a quantity of water that it could not have been consumed sufficiently by the time of the explosion to expose the crown sheet and that the fireman could easily tell whether the injector was working properly.

The fireman, Walton, testified that when the train left Roanoke the right injector was immediately turned on, and continuously thereafter worked properly, up to the instant of the explosion. In addition, it is a self-evident proposition that the injector started to working properly, else the train

could never have run the 18 miles which it did run before the explosion occurred. When it once starts working properly, the evidence is that it will continue to so work as long as the steam pressure is kept up. (Record, Pages 267, 270, 281.) Between Singer Tank and the place of the accident the full boiler pressure was maintained. (Record Page 49.) It may be taken as clearly established, therefore, that the injector was continuously forcing water into the boiler all the time after leaving Roanoke (the initial point), up until the explosion occurred.

Upon leaving Roanoke the water glass was half full. The water gradually rose in the glass until at Singer Tank it was half an inch from the top.

If the Court be of opinion that the evidence compels a finding that the explosion occurred from low water, the only way this could have happened would have been for the injector to have been working at less than full capacity and to have been supplying, all along, *a little less water than the engine was vaporizing into steam.* Therefore, immediately after leaving Roanoke, the water level should have gradually fallen in the water glass, if the water glass had been in good condition and registering properly. But the fireman says—the water gradually *rose* in the glass. It is a reasonable and proper inference, therefore, that if the water glass registered erroneously at Singer Tank, it had likewise been erroneously registering ever since leaving Roanoke, and had been indicating a rising level when it should have been indicating a falling level.

If either the top or bottom opening leading from the water glass into the boiler becomes stopped up by deposits of lime salts scale, which is always being precipitated from the boiling water on to metallic surfaces in contact therewith, this will cause the water glass to register erroneously. (Record, Page 477.) But if these openings are in a clean condition and free from deposits, it will take many hours for sufficient deposits to accumulate to close them. The evidence was undisputed that if these openings had been

in anything like proper condition at the beginning of the trip, the deposits could not have accumulated sufficiently fast to close them at the time the explosion occurred. (Record, Pages 118, 119.)

There is no evidence that the water glass openings had been cleaned out since the inspection of November 11th, nor is there any evidence that the water glass was subjected to any inspection or examination thereafter which would determine whether these openings were free from deposits. It is obvious that while one blowing out the water glass may ascertain that the openings are not *completely* closed, he cannot tell whether they are partially closed. On November 11th, the inspector, Funk, claims that a wire was run through the openings to clean out the scale, but no one claims to have cleaned them out after that time.

The fact that the openings were not stopped up when examined by the interstate commerce inspector several days after the explosion does not require an inference that they were open when the explosion occurred. This, because, in the first place, some employee of defendant, upon whom the blame for the unsafe condition would have fallen, could easily have unstopped the openings, and, in the second place, the pressure in the water glass if only one opening is stopped up, is the same as that in the boiler, and the effect of the sudden withdrawal of the pressure inside the boiler, due to the escape of the steam into the fire box, would be to "blow-out" the water glass as effectually as it could be done by turning the faucet of the water glass and allowing steam or water to escape therefrom into the cab, which is the ordinary method of temporarily unstopping the openings.

Therefore, if the explosion was actually caused by low water, clearly the jury might well have found that the water glass was not in proper condition when the engine was delivered to the plaintiff's intestate at the beginning of the trip.

## VIII.

THE FACT THAT IT WAS THE ENGINEER'S DUTY TO INSPECT HIS ENGINE AND RUN SAME, DOES NOT RELIEVE THE RAILROAD COMPANY FROM LIABILITY FOR HIS DEATH IF IT RESULTED WHOLLY OR IN PART FROM A DEFECTIVE BOILER OR DEFECTIVE WATER GLASS.

The contention of the defendant is that it can escape liability from injuries to an engineer due to a defective boiler or water glass by imposing on the engineer a general duty of inspecting the engine. This position is clearly untenable. The engineer, in the nature of things, is not a mechanic or expert inspector. The duties for which he is fitted are those appertaining to the running of his engine. This is vitally important and consumes all his time. As said by this Court in Chicago, B. & Q. R. Co. *vs.* United States, 220 U. S. 559, Congress intentionally imposed upon the railroads the absolute duty to have its appliances safe, "that this statute might induce such a high degree of care and diligence on the part of the railroad company as to necessitate a change in the manner of inspecting appliances, and to protect the lives and safety of its employees." If the company could relieve itself of responsibility for a violation of this duty by shifting it on to the employee, who is required to use the appliance *and for whose benefit and protection the duty was placed on the railroad,* it is obvious that the purpose of the statute would be entirely frustrated and the law would be but a dead letter.

But there is no evidence that there was imposed upon the engineer any specific duty with respect to the water glass, or that by any inspection he could make while the engine was in his charge, he could have ascertained the true condition of the water glass. The evidence seems to indicate that by opening the valve of the water glass he could tell whether water or steam would pass through from the boiler into the glass, but it would seem that this condition would exist even if one of the openings leading into the boiler was closed.

However this may be, it is clear that he could not tell whether the openings were clean and free from deposit. In fact, the evidence does not show exactly what he could ascertain by blowing out the glass.

As to the crown sheet, the testimony is that the only inspection he was supposed to make was to look through the fire box door up at the crown sheet. The evidence is clear that he could not have discovered by this method of inspection whether the crown sheet had been previously pocketed or overheated or not. It was shown that plaintiff's intestate did look at the crown sheet and if the defect had been discoverable by this method of inspection, the presumption is he would have discovered it.

Furthermore, it was the duty of other employees than plaintiff's intestate to inspect both the crown sheet and water glass, and if the defect was discoverable by inspection, the failure to discover and remedy same was as much the result of their negligence as it was the negligence of the plaintiff's intestate, and if the water glass or crown sheet was in an unsafe condition from a concurrence of his own negligence with that of other employees, plaintiff's right to recover is not prejudiced thereby, as contributory negligence is wholly abolished as a defense in this case.

Defendant has made the further contention that even if the water glass was defective, the plaintiff's intestate was negligent in relying thereon, and that, therefore, his death resulted solely from his own negligence.

This contention of the defense is rested upon the proposition that the engineer had two means of ascertaining the level of the water in the boiler—one by observing the water glass and the other by testing with the gauge cocks, consisting of three telltale holes or openings in the boiler head leading into the boiler, by turning the valves of which the water level may be ascertained. But the defendant's witness, Richardson, a locomotive engineer, stated that it was customary for the engineer to rely on the water glass, and that if it gets sluggish

or appears dangerous, *then* they test the gauge cocks to see if anything is out of order. (Record, Pages 274, 281.)

As this action, however, is for injuries to an employee due to violation of a statute enacted for his safety, the following quotation from the opinion of this Court in *Spokane & I. E. R. Co. vs. Campbell, 241 U. S. 497*, is equally applicable to this case. We have already quoted this excerpt, but as it is peculiarly applicable here, we will, for convenience, again do so.

> *"Upon the whole case, we have no difficulty in sustaining his right of action under the Employers' Liability Act. That Act imposes a liability for injury to an employee 'resulting* **in whole or in part** *from the negligence of any of the officers, agents, or employees of such carrier, or by reason of any defect or insufficiency, due to its negligence in its cars, engines, appliances * * * *or other equipment.' As was held in San Antonio & A. P. R. Co. vs. Wagner, 241 U. S. 476, a violation of the Safety Appliance Act is "negligence" within the meaning of the Liability Act. And by the proviso to Section 3 of the latter Act, no employee injured or killed shall be held to have been guilty of contributory negligence in any case where a violation of the Safety Appliance Act* **"contributed** *to the injury or death of such employee." It is too plain for argument that under this legislation the violation of the Safety Appliance Act need not be the sole efficient cause, in order that an action may lie. The Circuit Court of Appeals held that the element of proximate cause is eliminated where concurring acts of the employer and employee contribute to the injury or death of the employee. We agree with this, except that we find it unnecessary to say the effect of the statute is wholly to eliminate the question of proximate cause.* **But where, as in this case, plaintiff's contributory negligence and defendant's violation of a provision of the Safety Appliance Act are concurring proximate causes, it is plain that the Employers' Liability Act requires the former to be disregarded."**

The argument that the engineer was guilty of *contributory negligence* was apparently advanced by the defendant in the case of *Hough & Spradlin vs. Moreland's Admr.* (Ky.) *169 S. W. 467 (1914)*, where the plaintiff made the same alternate claims as here, first that the boiler exploded from unsafeness when the water was present, and, second, if it occurred from low water, as the defendants there claimed, it was the proximate result of defendants' negligence in failing to provide a water glass, though there were three gauge cocks, which defendants claimed dispensed with the necessity of a water glass. The Appellate Court upheld the action of the Lower Court in submitting the case to the jury *upon both theories*, and affirmed a judgment for the plaintiff for the death of her intestate, who was in charge of operating the boiler when it exploded, although contributory negligence would have been a complete defense in that case. Certainly if it was not *contributory* negligence as a matter of law, where there was no water glass to rely on or be misled by, it cannot be said to be the engineer's *sole* negligence when the glass was defective.

Also the case of *Southern Pacific Railway Company vs. Vaughn (Texas) 165 S. W.—; 7 N. C. C. A. 622*, brought under the Federal Employers' Liability Act, for the death of a locomotive engineer, appears to have been tried on the same alternate theories, that the explosion was due to a defective water glass, or to defective stay bolts. The defense was that the engineer negligently allowed his water to get low. It appears from the opinion that both theories were presented to the jury and judgment for plaintiff was affirmed. The evidence in that case showed that the hostler had inspected the water glass just before the engine went out, and found it in good condition, but the Court did not regard this as conclusive evidence that the glass was as the hostler thought or said he found it to be.

There is no evidence whatsoever in the record in this case that the plaintiff's intestate was guilty of any negligence. On the other hand, the evidence shows that he was

attending to his duties, and that he told the fireman a few minutes before the accident that they were making a nice run and would not stop at Singer Tank to take on water. (Record, Page 46.)

*In the absence of evidence of negligence on his part, the presumption of law is that he was exercising proper care for his safety.*

*W. & G. R. R. Co. vs. Gladmon, 15 Wal. 401.*
*Texas & Pacific R. Co. vs. Gentry, 163 U. S. 353.*

The defendant contends that there was no defect in the boiler or water glass, yet, in the same breath, claims that Andrews should have discovered the defect. In the absence of proof that the defect which actually caused the explosion was *discoverable* by inspection, it is difficult to understand how this contention can be maintained.

## Conclusion.

In conclusion, it is respectfully submitted that the plaintiff in error's right to recover in this case is supported by the evidence upon each of the following theories:

1. The circumstances, *standing alone*, permit an inference by the jury that the explosion was caused by either an unsafe boiler or an unsafe water glass.

2. The circumstances, taken in connection with the testimony of *plaintiff's* expert witnesses to the effect that the crown sheet and bolt heads presented an apperance of having been overheated on some occasion *prior to the accident*, permit an inference by the jury that the explosion was caused by *unsafe stay bolts and crown sheet;* and

3. The circumstances, taken in connection with the testimony of *defendant's* expert witnesses to the effect that the crown sheet and bolt heads presented an appearance indicating that they were overheated on account of low water *at the time of the accident*, permit an inference by the jury that the explosion was caused by an *unsafe water glass.*

If the Court should be of opinion that the evidence is sufficient to sustain *any one* of these three theories as to the cause of the accident, it follows that the judgment complained of should be reversed, and it is respectfully asked that this Court so order.

All of which is respectfully submitted.

A. B. HUNT,
A. P. STAPLES,
*Counsel.*

Dated at Roanoke, Va.,
March 20th, 1918.

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IN THE

# Supreme Court of the United States

**OCTOBER TERM, 1917**

No. 341.

MAUDE L. ANDREWS, ADMINISTRATRIX,
*Plaintiff in Error,*

*vs.*

THE VIRGINIAN RAILWAY COMPANY,
*Defendant in Error.*

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## BRIEF OF COUNSEL FOR DEFENDANT IN ERROR.

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### STATEMENT OF CASE

The statement of the case, as made by Counsel for the plaintiff in error, is controverted, because it is in many respects inaccurate, and is to some extent misleading. Certain facts are stated, as established by uncontroverted evidence, which are not established by the evidence when properly interpreted, and are directly in conflict with the findings of fact by the Supreme Court of Appeals of Virginia. Disconnected and isolated statements of witnesses are quoted as establishing certain facts, when such statements in connection with the context and whole testimony of the witness give an entirely different meaning to the statements of the witnesses.

Inasmuch as the facts of the case are stated accurately by the defendant in error in its petition, which is found on

Pages 1 to 4 of the Record, and by the Supreme Court of Appeals of Virginia, in its opinion, found on Page 578 of the Record, it is not thought necessary to make a complete detailed statement of the facts of the case.

For the purposes of this brief, however, the leading facts may be briefly stated as follows:

This action was originally brought in the Circuit Court of Montgomery County, Virginia. There was a trial of the issues involved before a jury, which resulted in a verdict in favor of the plaintiff, on which the said Circuit Court entered a judgment. This judgment, on writ of error to the Supreme Court of Appeals of Virginia, was reversed, and the case was remanded to the Circuit Court for a new trial, in accordance with the principles established by the Court of Appeals in its decision.

The case was then removed to the Circuit Court of Roanoke County, Virginia, and upon a trial in that Court, the evidence, as embodied in the record of the case, in the Supreme Court of Appeals of Virginia, was introduced, subject to objection by the defendant to such of said evidence as was improper under the decision of the Supreme Court of Appeals of Virginia.

By reference to the opinion of the Supreme Court of Appeals of Virginia, above referred to, it will be seen that a large part of the evidence of the witnesses for the plaintiff, and on which the plaintiff relies, in its brief filed herein as establishing certain facts, was improper and inadmissible.

Upon a demurrer to the evidence by the defendant and joinder therein by the plaintiff, the Circuit Court of Roanoke County entered a judgment for the defendant. From this judgment a writ of error was prosecuted to the Supreme Court of Appeals of Virginia, which writ of error was first refused by all five of the judges of said Court individually, in vacation, and, upon being presented to the whole Court in session, was refused by the Court. This was in accordance with the Virginia Statute that when the judgment complained of is plainly right, the petition for a writ

of error, should be rejected, but the rejection of such petition by a judge in vacation shall not prevent the presentation of such petition to the Court at its next term.

The effect of these proceedings was to establish in the said Courts findings of fact which are only subject to review in a limited way by this Court.

It appears from the opinion of the Circuit Court, found on Page 604 of the Record, that the Circuit Court entered its judgment based on the findings of facts and conclusions of law as set forth n the opinion of the Supreme Court of Appeals of Virginia, found on Page 578 of the Record.

The effect of the refusal of a writ of error from that judgment by the Supreme Court of Appeals of Virginia, was a concurrence by that Court in the facts and conclusions of law so established. Whatever may have been the views of the judge of the Circuit Court on the former trial, the judgment sought to be reviewed in this Court is based upon this finding as to the facts and the law of the case on which the said Circuit Court entered the judgment under review in this Court.

The Supreme Court of Appeals of Virginia, in its opinion above referred to, in narrative form, states an outline of the salient facts as established by the Record. In this outline, of facts, all questions in controversy were reviewed and findings of fact established. The result of this review and finding on questions of fact in controversy was the conclusion by the Court, after rejecting the improper evidence admitted, that all of the evidence, viewed from the standpoint of a demurrer to the evidence, shows that when the engine was turned over to the plaintiff's intestate the boiler and appurtenances were in proper condition and safe to operate in moving traffic without unnecessary peril to life and limb.

The main facts relied upon by the plaintiff, as established by the testimony in this case, are directly in conflict with the findings of fact by the Supreme Court of Appeals of Virginia, on which the judgment sought to be reviewed in this case is based.

Under the opinion of the Supreme Court of Appeals the testimony of certain witnesses is rejected as improper. This is particularly true as to the testimony of the witnesses Walton and Richardson, as to the operation of the injector, and the opinion evidence of the expert witnesses for the plaintiff This rejected evidence is the foundation for the main facts on which the plaintiff bases the argument for a reversal of the judgment by this Court. This is in absolute disregard of the rule established by this Court as to the review of the rulings of Courts below on questions as to the admissibility of testimony.

The plaintiff seeks a reversal by this Court on the ground of an erroneous construction of the Federal Boiler Act by the Supreme Court of Appeals of Virginia. From an analysis of the opinion of the Court, it will appear that the ultimate ground of the decision of said Court was the findings of fact by the Court that the requirements of the Federal Boiler Act had been met and satisfied by the defendant. The only interpretation placed upon the Federal Boiler Act by said Court was, in effect, that when it affirmatively appears that an engine satisfying the requirements of the Act has been delivered to an engineer to be operated by him, and an explosion occurs which results in the death of the engineer, then in order for his representative to recover on account of alleged defects proof of such alleged defects must be furnished. In other words, as stated by the Court, when the carrier performs its statutory duty of turning over to the engineer an engine in proper condition and safe to operate, it is not answerable to the engineer as an insurer of his safety throughout the run.

There was no question before the Supreme Court of Appeals of Virginia as to the absolute duty of a railroad company to have its locomotives equipped with safe and suitable boilers and appurtenances, and to maintain the same in that condition.

It will be seen from Pages 5 and 6 of the Record that this defendant, in its petition to said Court for a writ of

error, admitted that it was under this absolute duty in respect to the boiler and its appurtenances of its engines. It further appeals that the only question involved was as to the burden of showing the existence of the defect from which an inference arises that this absolute duty has been violated. The contention of the plaintiff was that under all circumstances an inference of a defect should result from the mere fact of an explosion. The contention of the defendant was that an inference of a defect would not result from the fact that there was an explosion unsupported by any other facts, because explosions might, and do often, result from other causes than defects in the boiler and appurtenances.

The uncontradicted evidence showed that the explosion of the boiler which resulted in the death of the plaintiff's intestate was caused by the tearing off of the heads of the stay bolts which supported the crown sheet. The crown sheet itself did not give way and after the explosion was not torn or injured in any way, except that it was bulged and forced down for a distance of about ten inches as the result of the breaking off of the heads of the stay bolts by which the crown sheet was held up and supported.

The testimony of the witnesses for the plaintiff, as well as the testimony of the witnesses for the defendant, shows that the crown sheet had been burned; that is to say, it had been heated with no water on top of it. There were a number of witnesses for the defendant, including two government experts, who examined the engine after the explosion, all of whom were shown to have had a wide experience in the inspection of crown sheets which had failed, who testified that the burning of the crown sheet and the consequent weakening of the stay bolts was the cause of the explosion. These witnesses, introduced by the defendant, were also of the opinion that the burning of the crown sheet resulted from low water in the boiler at the time of the explosion. The expert witnesses of the plaintiff who testified in the case did not advance any

definite, positive opinion as to what caused the stay bolts to break, but it is a fair inference from the testimony of their witness, Randolph, who alone attempted to express any opinion on the subject that the burning of the crown sheet was the cause of the failure of the stay bolts. He seemed to differ with the witnesses for the defendant only on the question of how long prior to the failure the burning of the crown sheet had occurred. In his opinion it might have been burned at any time between half an hour prior to the time of failure, or three or four months prior to the time of the failure, and this opinion was based alone upon the color of the crown sheet at the time of trial, which took place nearly two years after the accident.

In the opinion of Scrivenor, the only other expert witness of the plaintiff, the appearance of the crown sheet itself was not positive proof that it failed from low water and, in regard to the cause of the failure, he expressed the opinion that it might have been caused from low water, or might have been caused from other things.

In passing upon the respective contentions of the parties based upon this testimony, and particularly the contention that the negligence of the engineer should only go to mitigate damages, the Supreme Court of Appeals of Virginia held that the evidence tends to show that the negligence of the plaintiff's intestate was the sole cause of his death.

This conclusion of the Court necessarily involved the holding by the Court that the evidence shows that the crown sheet was burned on that trip through the negligence of the engineer in allowing the water in the boiler to become so low that the crown sheet was uncovered. That this was the conclusion of the Supreme Court of Appeals of Virginia, is shown by the fact that the Court considered this view of the case controlling and rendered it unnecessary to pass on other assignments of error.

## BRIEF OF THE ARGUMENT

The presentation of this case will involve a consideration of the following propositions:

(1) The burden of proof as to alleged defects under the Federal Boiler Act;

(2) The rule applicable under the Virginia practice in considering evidence on demurrer to the evidence;

(3) The findings of fact by the State Courts and the effect of such findings upon this writ of error;

(4) The conclusions of the State Courts as to the facts and inferences resulting therefrom are not so palpably erroneous that this Court upon an examination of the evidence will base a reversal of the judgment upon that ground.

These questions will be briefly discussed in the order stated above:

### I.

### The Burden of Proof as to Alleged Defects Under the Federal Boiler Act.

The different contentions of the parties in the Supreme Court of Appeals of Virginia, as to the proper construction of this Act, have already been stated. The construction placed on the Act by the Supreme Court of Appeals of Virginia the plaintiff alleges is erroneous, in that the Act imposes upon a railroad company the absolute duty to have its locomotives equipped with safe and suitable boilers and appurtenances thereto at all times while moving interstate traffic. The existence of this duty has never been denied by the defendant, and the Supreme Court of Appeals, in its opinion, recognized the existence of this duty. The said Court, viewing the evidence as on a demurrer to the evidence, found as a fact in this case that the defendant had discharged its statutory duty by turning over to the

plaintiff's intestate a locomotive engine and boiler with appurtenances in proper condition and safe to operate. In these circumstances, the Court held that in order for the plaintiff's intestate to maintain an action for his death caused by the explosion of the boiler, the burden was upon the plaintiff to show that the explosion resulted from a defect in the boiler or its appurtenances as charged in the declaration. The said Court did not hold, and there is nothing in its opinion from which such a holding may be inferred, that the failure to furnish a boiler and appurtenances in proper condition and safe to operate was not a violation of the duty of the carrier under the Federal Boiler Act.

The decision of the Court construing and applying the Federal Boiler Act to this case was clearly based upon the ground that the defendant had satisfied the requirements of the Act in turning over to the plaintiff's intestate an engine with boiler and appurtenances in proper condition and safe to operate. If the evidence had tended to show the existence of any defect in the boiler or its appurtenances, which caused the explosion, the Court would unquestionably have held the defendant guilty of a violation of its statutory duty, which of itself would have rendered the defendant guilty of negligence. The question here is not when and under what circumstances negligence will be inferred from a defect shown to exist in the boiler or its appurtenances of a locomotive engine, but when and under what circumstances a defect in the boiler or its appurtenances will be inferred from the fact that the boiler exploded. The plaintiff's contention is that under a proper construction of the Boiler Act, the mere fact of an explosion is sufficient for the inference to result that there was a defect in violation of the Act. As to whether or not this is the true interpretation of the Act does not arise in this case, because according to the uncontradicted evidence, including the inspections and reports of the engineer himself, the boiler and its appurtenances were in such condition as to

satisfy the requirements of the Act when the engineer took charge of the engine on the night of the explosion. The evidence shows, and it is a fact of common knowledge, that the most frequent cause for the failure of crown sheets in engines is low water, for which the engineer alone is responsible. This being true, it would be, to say the least, a harsh and unreasonable construction to place on the Boiler Act to say that the failure of a crown sheet was in itself evidence of a defect in the boiler and its appurtenances. The question as to whether or not such a construction of the Act would be proper, as already shown, does not arise in this case. The purpose and terms of the Boiler Act would not reasonably require such a construction. Section 2 of the Act is quoted on Page 4 of the plaintiff's brief, from which it appears that it is required that the boiler and its appurtenances must be sufficient to withstand certain prescribed tests. When the Act is read as a whole, it is obvious that it only requires the carrier to maintain the boiler and its appurtenances in a proper condition and safe to operate without unnecessary peril to life and limb. The Act expressly recognizes that there is at least some degree of peril connected with the operation of a locomotive engine and the carrier is only required to have the engine in such condition that it may be operated without unnecessary peril. Under any proper construction of the whole Act, it certainly could not be reasonably contended that if the carrier maintained its boiler and appliances up to the standard of efficiency prescribed by the Act, that then the mere fact of an explosion would cast upon the carrier an imputation of negligence and the burden of showing that the explosion resulted from causes other than a defect in the boiler or its appurtenances.

In cases arising under the Act, as well as in other negligence cases, in order for negligence to be inferred from the happening of an accident, there must be shown by the evidence such a condition of affairs that the accident, according to the ordinary experience of mankind, might

have been caused by the failure of the defendant to perform some legal duty. When the facts, as shown by the evidence, establish that the defendant has performed every duty imposed by the law, then no inference of negligence will result from the happening of an accident.

*Ryan vs. Falls River Iron Works Co.*, 200 Mass. 188, 86 N. E. 310

*Saxe vs. Walworth Mfg. Co.*, 191 Mass. 338; 77 N. E. 883.

The cases cited in the plaintiff's brief construing the Safety Appliance Acts are clearly not applicable in construing the Federal Boiler Act as applied to the facts of the instant case. The Safety Appliance Acts prescribe a definite and absolute standard for the particular appliances covered by the Acts.

In every case cited and relied on; the facts and circumstances in evidence were such as to show that the appliances failed to measure up to the prescribed standard. In other words, the mere happening of the accident was of itself a fact from which a reasonable inference resulted that the appliances at the time of the accident did not measure up to the standard prescribed by the Safety Appliance Act involved.

In the nature of things, as already shown, the failure of a crown sheet is not in itself evidence of a defect in the boiler or its appurtenances, and especially is this so when practically all such failures, as shown by the evidence in this case, are due to low water in the boiler.

## II.

### The Rule Applicable Under the Virginia Practice in Considering Evidence on a Demurrer to the Evidence.

The rule as stated on Page 48 of the plaintiff's brief for determining the effect of evidence when considered on

a demurrer to the evidence is correct. The qualification of the rule to the effect that in considering evidence upon a demurrer to the evidence the Court will not take detached statements of witnesses, but will consider the entire evidence of the witnesses, and will give a fair construction to the entire testimony of each witness is equally well established.

*N. & W. Ry. Co. vs. Holmes*, 109 Va., 407.

This qualification of the rule is absolutely disregarded by counsel for plaintiff in their brief. In making reference to the evidence of witnesses they have in many instances picked out isolated statements of witnesses, which when read in connection with the entire evidence of the witnesses would convey an entirely different meaning from that intended to be conveyed by counsel in their brief.

It is equally well settled in Virginia that a demurrer to the evidence does not waive objections to illegal evidence.

*N. & W. Ry. Co. vs. Warden, 117 Va., 801.*

The rule is also absolutely disregarded by counsel for plaintiff in their brief. They refer to in support of their contentions and base most of their arguments on testimony which has been excluded or which is clearly improper under the opinion of the Supreme Court of Appeals of Virginia.

## III.

### The Findings of Fact by the State Courts and the Effect of Such Findings Upon This Writ of Error.

The Supreme Court of Appeals of Virginia, after reviewing the evidence, finds the facts as follows: "We are of the opinion that the body of the evidence, viewed from the standpoint of a demurrer to the evidence, shows that on the night of November 14, 1912, when the engine was turned over to the plaintiff's intestate, the boiler and its appurtenances were in proper condition and safe to operate

in the service to which the same were to be put in moving traffic without unnecessary peril to life and limb within the true intent and meaning of the Act of Congress. When the explosion occurred the locomotive engine and boiler and appurtenances were in the exclusive custody and control of the engineer, and were being operated by him. ..... Nor is this a case, as was pressed in argument, where the negligence of the engineer should go to mitigate damages, and not to bar the right of action. The evidence tends to show that the negligence of the plaintiff's intestate was the sole cause, not the contributing cause, of his death and, therefore, the rule invoked under the Employers' Liability Act has no application." (Record, Pages 582-583.)

This is a clear finding that the boiler was in proper condition and safe to operate, and the explosion was due to the negligence of the plaintiff's intestate in allowing the water in the boiler to become so low as to burn the crown sheet and cause the explosion. The case was remanded to the Circuit Court for a new trial. On the second trial, the Circuit Court excluded certain evidence which the Supreme Court of Appeals held was inadmissable. (Record, Pages 599-603.)

The evidence on the second trial, therefore, so far as it went, was identical with the evidence on the first trial, but did not include many of the speculative theories and conjectures of the witnesses as to what might or might not have caused the explosion.

The defendant demurred to this evidence, as submitted to the jury, which demurrer was sustained by the Circuit Court, and a judgment was entered thereon in favor of the defendant. There is nothing in the Record to indicate that the Judge of the Circuit Court regarded this evidence as sufficient to sustain a verdict adjudging that the explosion occurred from any defect in the boiler or its appurtenances. On the contrary, the Circuit Court, upon the demurrer to the evidence, entered an order stating that

"the evidence is not sufficient in law to maintain said issue on the part of the plaintiff," and thereupon sustained the defendant's demurrer, setting aside the verdict of the jury and dismissing the plaintiff's action. (Record, Pages 603-604.)

This is a solemn, judicial decision of the case by the Circuit Court, setting aside the verdict of the jury in favor of the plaintiff and entering judgment in favor of the defendant. There is nothing in the Record to indicate that the Judge of the Circuit Court entertained a private opinion as to the effect of this evidence differing from the judicial opinion entered of record as the judgment of the Court.

In theory, at least, the presumption is that when a Trial Court has been reversed by an Appellate Court, and thereafter enters judgment in the case in accordance with the decision of the Appellate Court that the Trial Court both privately and judicially acquiesces in the decision of the Appellate Court. However that may be, we are dealing here only with the judicial opinion and decision of the Circuit Court, that being the judgment under review in this case, and we are not concerned with what may have been the private opinion, not judicially expressed, of the Judge of said Court.

A petition for a writ of error to this judgment was presented to the Judges of the Supreme Court of Appeals of Virginia, in vacation, and was refused by them; and thereafter, the said petition was presented in open Court when the Court was in session and was refused by the Court. (Record, Page 606.) The refusal of this petition was based on the ground that the judgment of the Circuit Court sought to be reviewed was plainly right.

We, therefore, have this situation: The case was tried before a jury and resulted in a verdict on which the Trial Court entered a judgment. On a writ of error, the Supreme Court of Appeals of Virginia was of the opinion that the evidence did not sustain the verdict and remanded the

case to the Circuit Court for a new trial. The Supreme Court of Appeals expressed the opinion that some of the evidence admitted at the former trial had been improperly admitted.

On the second trial, the Circuit Court, on this revised record, held that the evidence was not sufficient to warrant a verdict for the plaintiff. This judgment was then reviewed by all of the five judges of the Supreme Court of Appeals, acting individually, in vacation, and by the Court in term, and the action of said Circuit Court was affirmed on the ground that it was plainly right.

The case presented by this record is, therefore, identical with *Baugham vs. N. Y. P. & N. R. R. Co.*, 241 U. S. 237; 60 L. Ed. 977, where the Court, after stating the respective contentions of the parties, said:

"A determination of these contentions depends upon the evidence, and, considering it, the said Courts, Trial and Appellate, decided against the contentions of the plaintiff, and in so doing in effect held that the conditions of the assumption of risk by deceased were satisfied. Gila Valley G. & N. R. Co. *vs.* Hall, 232 U. S., 94, 102; 58 L. Ed. 521, 524; 34 Sup. Ct. Rep., 229.

We have considered the evidence, and we cannot say that the conclusion was palpably erroneous, and following the rule expressed in Great Northern Ry. Co. *vs.* Knapp, 240 U. S. 464-466, and as having analogy, Chicago Junction Ry. Co. *vs.* King, 222 U. S. 222, we announce our concurrence without discussion."

The present case then is one which does not involve the interpretation of the Federal Boiler Act, or the definition of any legal principle in its application, but simply involves an appreciation of all the facts and admissible inferences in the particular case for the purpose of determining whether there was sufficient evidence to warrant submitting to the jury the question of whether or not the boiler was defective. The State Courts have held that

there was not sufficient evidence to go to the jury. This Court will not disturb the decision unless the error is palpable.

*Great Northern Railway Co. vs. Knapp*, 240 U. S. 464.

This Court will not disturb the decisions of the State Courts unless they committed manifest error.

*Erie R. R. Co. vs. Welsh*, 242 U. S. 303.

*S. A. L. Ry. Co. vs. Koennecke*, 239 U. S. 352.

The effect of these decisions is that the findings of fact by the State Courts will not be disturbed unless there is manifest, or palpable error, and the next inquiry is as to whether or not upon an examination of the evidence there is such error as will warrant a reversal of the judgment.

## IV.

### The Conclusions of the State Courts as to the Facts and Inferences Resulting Therefrom are not so Palpably Erroneous that this Court Will Base a Reversal of the Judgment on that Ground.

If it is conceded for the purpose of this argument that the Court should examine the evidence uninfluenced by the decisions of the State Courts, the evidence wholly fails to show, or even tend to show, a defect in the boiler or its appurtenances. On the other hand, the admitted facts and uncontradicted evidence in the case inevitably lead to the result that the explosion was caused by low water in the boiler, through the negligence of the plaintiff's intestate. It is an uncontroverted fact that the failure of the boiler was due to the giving away just beneath the crown sheet of the stay bolts which held the crown sheet in place. There was no question as to the sufficiency of the crown sheet itself. A number of the bolt heads which broke off and caused the crown sheet to fail were found in

the fire box after the explosion, and were offered in evidence. These bolt heads were broken down into the heads where they rested against the crown sheet, and the breaking occurred in the thickest and strongest part of the bolt heads. The plaintiff's contention in the Courts below was that the crown sheet gave way on account of some weakness in the bolts. The defendant's claim was that the bolt heads were weakened and caused to fail by being hot to such a degree as to weaken their strength, and were so heated on account of low water in the boiler.

It was an undisputed fact, testified by the plaintiff's experts, that the crown sheet offered in evidence had at some time prior to the failure been burned; that is heated with an absence of water on top of it. The specific question of fact to be determined is as to what caused the stay bolt heads to break; that is, was it on account of some weakness in the bolts themselves, which existed prior to the commencement of that trip, or was the crown sheet burned on that trip on account of low water in the boiler.

The plaintiff's case wholly depends upon the testimony of Jerry Walton, the fireman, and two so-called experts, Scrivenor and Randolph. This being so, it may be well to analyze the testimony of these witnesses and determine exactly what are the facts as testified to by them. The fireman, Jerry Walton, was a very pliable witness, and was willing, under the lead of counsel for the plaintiff, to testify to matters necessary to the plaintiff's case about which he had absolutely no knowledge, as his own testimony shows. The testimony of Jerry Walton, so far as it is involved here, only related to the water glass gauge and the injector. As to the water glass gauge, he testified that when they left Roanoke it was about half full; that he watched the water glass gauge on that trip; paid attention to it pretty much all the way until the train crossed the Norfolk & Western overhead bridge. (Record, Page 57-58.) That he did not look at the water glass gauge again until they were going by Singer tank; that the water was then a short

distance from the top of the glass; that he did not look at it again between that point, and the point where the explosion occurred. (Record, Page 58.)

In connection with what he said about the height of the water in the glass, it will be noted that his testimony was very indefinite. After measuring on his finger, the height of the water in the glass, he said, at the suggestion of counsel, that the water was something like one-half inch from the top (Record, Page 46) and when asked about it on cross-examination, he said he was uncertain about the water in the glass, and said he did not know whether on the former trial he said it was an inch from the top. (Record, Pages 60 and 61.) This witness does not claim to have observed the height of the water in the glass from the time the train crossed the Norfolk & Western overhead bridge until the train reached Singer tank, a distance of several miles, nor does he claim to have observed the height of the water in the glass from Singer tank to the point where the explosion occurred, a distance of about two and one-half miles. On the uncertain testimony of this witness, counsel for the plaintiff attempt to base a very accurate calculation as to the quantity of water in the boiler at the time the train passed Singer tank, when the witness claims to have last observed the water glass, to show that the water in the boiler, as indicated by the water glass, could not have been exhausted between that point and the point of explosion.

The difference of an inch or half an inch in the height of water in a water glass, under the varying conditions of operation, as shown by the Record, may have caused the crown sheet to have become uncovered. Moreover the plaintiff's calculations are based on the quantity of water that would be in the boiler above a point three inches below the top of the crown sheet. Obviously, the calculation is of no value because the crown sheet would begin to give way as soon as a portion of it became uncovered and softened from the heat, and, further, because we have no means of

telling how much of the water was below the top of the crown sheet.

In regard to the injector, this witness stated that the right injector was put in operation as the train passed out of the switch on the main line in the Roanoke yard (Record, Page 45); that this injector stayed on until the time of the explosion; that under ordinary conditions, such as the engine was working under on that trip, one injector will supply sufficient water for the boiler. (Record, Page 45.) He further says that the injector was forcing water in the boiler; that the water glass indicated that it was (Record, Page 45-46); that independent of the water glass, he could tell by the sound of the injector that the water was being forced into boiler. (Record, Pages 46-48.) His testimony in regard to the injector showed that this was his first trip on this engine (Record, Page 46); that he did not know where the injector on this type of engine was located, and he actually stated that the injector and pipe leading from it into the boiler were located inside of the cab, when, as a matter of fact, they are outside of the cab. (Record, Pages 61 and 63.) He did not know how many valves it was necessary for the engineer to use to put the injector into operation. In this connection, it may be noted that he was not familiar with this type of engine, and knew absolutely nothing about engines of this type. (Record, Pages 66 and 67.)

He repeated time and again the statement that he was not familiar with this type of engine, and this type of injector; that he was not familiar with that engine and never had anything to do with the operation of the injector. (Record, Pages 62 and 63.)

The Supreme Court of Appeals, after reviewing the evidence of this witness, held that his opinion evidence was plainly inadmissible, the effect of which was to reject the opinions expressed by him as to the operation of the injector.

The next witness on whom the plaintiff relies is Arthur Scrivenor, an alleged expert mechanical engineer, of wide

experience and study. It appears that this witness never saw the engine, crown sheet, broken bolts, or anything that would throw light on the cause of the happening of the accident until he appeared in court to testify as an expert for the plaintiff (Record, Page 112); that he had had absolutely no experience with crown sheets in locomotive engines that had failed on account of low water, or in any other engines for that matter; that he had had nothing whatever to do with locomotive engines since 1893 when he was a draftsman in the Richmond Locomotive Works; that he was unable to say whether he had ever in his life seen a crown sheet that had failed on account of low water. (Record, Page 87.) His opinion was that the crown sheet itself was not positive proof that it failed from low water, and when asked as to the cause of the failure, he said that in his opinion, it might have been caused from low water, or might have been caused from other things. (Record, Page 88.) This witness based his opinion entirely on the color of the crown sheet at the time of the trial, and stated that he could not say definitely how hot the sheet could have been to retain its present appearance, as he had no records of his own covering that point. He further said that if a burned crown sheet gets only a small quantity of oxygen, and a small quantity of air in contact with it, it may be blue, if very highly heated, and if it gets very much air in contact with it, it will be red. (Record, Page 92.) When asked on cross-examination if he could look at the sheet and tell whether or not it had been burned, he replied: "I have never seen a burned one just exactly that same color with water on top. That must be my reply, because I cannot say that I ever saw a sheet that I positively knew there was no water on top." (Record, Pages 91 and 92.)

The whole of the testimony of this witness is inadmissible under the opinion of the Supreme Court of Appeals of Virginia, and that Court very properly said that the conclusions expressed were matters of speculation and possessed no evidential value.

The plaintiff's other expert witness was a professor of mechanical engineering, who had not had any practical experience with locomotive boilers for a period of twenty-one years, and who came to testify in the case as an expert without having seen the engine, crown sheet, or the stay bolts, or anything that would throw light on the cause of failure. (Record, Pages 131 and 151.) It further appears that during his whole life he had never seen a single crown sheet that had failed from causes other than from low water (Record, Page 145); that during the past twenty years he had only seen three crown sheets that had failed from low water; one on the side of the railroad track, which he had observed from a passing train, another in a scrap pile at the Richmond Locomotive Works, and the other on the B. & O. Ry. fifteen or twenty years ago. (Record, Page 150.) He testified that he had examined the crown sheet in this case, and could see no indication of the absence of water at the time the crown sheet failed. (Record, Page 113.) He based this conclusion entirely upon the color and condition of the surface on the fire side of the sheet. (Record, Page 147.) He said that there was nothing else about the sheet except the color that would enable him to say that it went down with water on the sheet. (Record, Pages 147 and 148.) He admitted that the bagging between the stay bolts indicated that it had been burned or scorched at some time prior to the failure; that is, heated to a higher degree of temperature than it was ever intended to be heated. (Record, Pages 114-126.) He did not think that the appearance of the sheet indicated that it had been heated beyond a dark red (Record, Page 114); and says that the tensile strength of good stay bolt iron should not be injured sufficiently at that degree of temperature to cause failure (Record, Page 115); and, that in order for a failure to have been caused exclusively by low water, the heat must have been more intense than a bright red. (Record, Page 115.) He further says that while a crown sheet may be scorched or burned from having mud or oil on top of it, that the appearance of

this sheet indicated that it was more likely to have been scorched without water on top of it, and that the bags between the bolt holes show that the crown sheet was hot under pressure, and he thinks that the bagging was caused by being hot under pressure without water on top of it. (Record, Page 130.) This latter statement of the witness is in direct conflict with a previous statement to the effect that in his opinion the bags or bagging of the crown sheet between the stay bolts indicates that it was covered with water when it failed. (Record, Page 119.) When asked as to when this burning of the crown sheet occurred, he stated that it might have been three or four days, or it might have been as many seconds before the failure; that he could not tell; that if scorched a half hour before failure—certainly three-fourths of an hour before failure, and water had come back on the sheet, the conditions would be just as we find them. (Record, Pages 148 and 149.) This witness advanced various speculative theories as to how stay bolts may be weakened or injured, but as these opinions were purely speculative, they were clearly inadmissible.

The opinions of this witness, as to the cause of failure, the Supreme Court of Appeals of Virginia held were matters of speculation and possessed no evidential value. If his opinions can be said to establish anything as to the cause of failure, they only show that the crown sheet was scorched, or burned, at some time prior to the failure, and that this may have been done at any time from one-half hour prior to the failure to as much as three months prior thereto. As to the injector, the witness, Randolph, stated that he was familiar with the non-lifting type (Record, Page 117); that it is simple and has come into general use, and is a good injector (Record, Pages 117 and 118); that the only objection to this type of injector is that it is out of reach and difficult to hear; that he had trouble in operating them on dark and rainy nights, because it was difficult to tell whether it was working and putting water into the boiler. (Record, Page 118.) When the injector breaks with the waste pipe on the

outside a man could look out of the window and see if the injector is working or not, and that he doubts if he could hear the noise of escaping steam with the window closed. (Record, Page 118.) In regard to the water glass gauge, he testified that it would not have been possible for scale—if you mean by scale lime salts deposited from the water—to close up the gauge in an hour or so. (Record, Pages 118 and 119.) It clearly appears that he was limiting his testimony on that point to the deposit of lime salts and that he recognized the possibility of its becoming stopped up in some other way.

The first question of fact to be determined from the evidence is, as already shown, what caused the stay bolt heads to break. When the evidence is considered as on a demurrer to the evidence, certain facts are established by the testimony of the witnesses, both for the plaintiff and defendant, which show conclusively that the cause of the failure of the stay bolts was due to the burning of the crown sheet, through the negligence of the plaintiff's intestate at some time after the commencement of the trip on which the explosion occurred.

The following facts established by the evidence when viewed as on a demurrer to the evidence demonstrate that the accident occurred on account of the crown sheet having been burned, and that the burning of the crown sheet was caused by low water after the engine was delivered to the plaintiff's intestate.

(1) The appearance of the crown sheet indicated that it had been burned; that is, overheated at some time prior to the failure.

There were a number of witnesses, with large practical experience, who testified for the defendant that the crown sheet had unquestionably been burned, and that the explosion was caused by low water in the boiler at the time of failure.

The plaintiff's witness, Randolph, was of the opinion that the crown sheet was burned on account of low water in

the boiler. (Record, Page 129.) The appearance of the crown sheet, in the opinion of the plaintiff's other expert witness, Scrivenor, indicated that it may have failed from low water, or from other causes. (Record, Page 88.)

This evidence is conclusive to the effect that the crown sheet was burned at some time prior to the failure. The only difference of opinion between the witnesses for the plaintiff and defendant is as to when the burning occurred. In the opinion of the plaintiff's witness, Scrivenor, the burning may have occurred at the time of the failure, as the appearance of the sheet, in his opinion, indicated that it may have failed from low water, or from other causes. (Record, Page 88.)

In the opinion of the plaintiff's witness, Randolph, the absence of the red oxide color on the crown sheet indicated that the crown sheet had water on it at the time of the failure. (Record, Pages 113 and 114.) He bases this conclusion upon the color and condition of the surface of the fire box side of the sheet. (Record, Pages 147 and 148.) In his opinion this burning might have occurred at any time within from one-half hour prior to the failure, or three or four months prior to the failure. (Record, Pages 148 and 149.) The opinion of the witness, Randolph, that the burning of the crown sheet occurred at sometime prior to the failure, based entirely on the color of the sheet, is inconsistent with the theory of the witness, Scrivenor, that if a burned crown sheet gets only a small quantity of oxygen and a small quantity of air in contact with it, it may be blue as this sheet was, and if highly heated and gets very much air in contact with it, it may be red. (Record, Page 92.) This opinion of Randolph as to when the burning occurred is also contrary to conclusions which he admitted resulted from the existence of certain physical facts as will be hereinafter shown.

(2) The test to which the stay bolt material used in this engine was subjected shows that the material was free from all defects.

The design of the engine was such that the stay bolt material should stand a pressure of about sixteen times the pressure to which the stay bolts were subjected at the time of the failure. (Record, Page 322.) The material of which the stay bolts were made was subjected to the usual and customary tests before being used for making the stay bolts and under these tests proved to be satisfactory. (Record, Pages 166, 167, 172, 173, 177, 178, 179.) The material in some of the stay bolts which failed was tested after the explosion and found to be of sufficient tensile strength. (Record, Page 345.) When the engine was completed by the builders, and before it was delivered to the defendant, the boiler was subjected to water and steam tests under pressure greater than the steam pressure in the boiler at the time of failure, and satisfactorily withstood these tests. (Record, Pages 179, 208, 210.)

(3) The bagging of the crown sheet between the stay bolt holes on account of the crown sheet having been burned was such as to have caused leakage.

As a result of the explosion that portion of the crown sheet which failed was stretched and blow down for a distance of about ten inches below its normal position. (Record, Pages 340, 440.) The necessary effect of the crown sheet being blown down in this position was to have a tendency to reduce, or smooth out the bags between the stay bolt holes. (Record, Page 340.) After the failure, the bags between the stay bolt holes in that portion of the sheet which was blown down, were about one-eighth to three-sixteenths of an inch. (Record, Page 130.) The heads of the stay bolts which rested against the crown sheet were forced into a convex shape by the bagging of the sheet between the stay bolts prior to the failure. (Record, Pages 130, 340.) The shape of these stay bolt heads, which were found in the fire box after the explosion, as well as the bags between the stay bolt holes remaining in the crown sheet after it was blown down, show the extent to which the crown sheet was stretched by being overheated. The uncontradicted evi-

dence was to the effect that a crown sheet stretched to this extent by being burned at any time previous to the failure would have leaked. The plaintiff's witness, Randolph, says that the bagging between the stay bolt holes caused by the sheet being burned, would have caused leakage, unless something had been done to stop the leakage. (Record, Pages 145, 146.) There were a number of witnesses, all being men of practical experience, who testified for the defendant that the crown sheet was stretched by being burned to such an extent that the engine would have leaked so badly that it could not have been operated. (Record, Pages 414, 430.)

(4) The threads on the stay bolts which failed were not stripped, and the threads in the bolt holes in the crown sheet were not stripped.

Stay bolts have threads on them just above the bolt heads. These threads are screwed into the threads in the stay bolt holes of the crown sheet and the crown sheet rests against the stay bolt heads. These stay bolt heads must be so firmly screwed against the crown sheet, and the fit of the threads of the stay bolt in the threads in the hole of the crown sheet must be so perfect as to prevent leakage when the crown sheet is covered with water under a pressure of from 185 to 200 pounds to the square inch. The threads in the stay bolt holes of that portion of the crown sheet which was blown down, were so perfect after the explosion that the plaintiff's expert, Randolph, could only detect with a magnifying glass that the threads in a few of the holes had been bruised or forced out of their normal position. The uncontradicted evidence of the defendant's witnesses showed that the threads on the stay bolts which were screwed into the stay bolt holes had not been stripped by the explosion, and were in perfect condition That the threads on the stay bolts were in this condition, was conclusively demonstrated by the condition of the threads in the stay bolt holes in the crown sheet, because if the threads on the stay bolts had been stripped, the threads in the crown sheet would likewise have been stripped or battered to some extent, at least, and

would not have presented the perfect appearance that they did present after the explosion.

The fact that these threads were not stripped conclusively shows that at the time the crown sheet was blown down the crown sheet was soft and pliable from being overheated, and was stretched to such an extent before the bolt heads gave way that the threads on the stay bolts which were screwed in the crown sheet were entirely separated. This conclusively demonstrates that the crown sheet was over-heated on account of low water at the time of failure, as testified to by witnesses for the defendant. It also conclusively demonstrates that there would have been leakage to such an extent that the engine could not have operated, as testified to by the witnesses for the defendant, if the burning of the crown sheet had occurred at any time previous to the time of failure.

(5) The bagging of the crown sheet between the stay bolt holes was such that it could have been discovered by inspection.

The plaintiff's witness, Randolph, testified that the bagging of the crown sheet between the stay bolt holes on account of being burned was such that it could have been discovered by inspection, and that anybody with any experience whatever in the inspection of crown sheets would readily have discovered that this crown sheet had been burned. (Record, Pages 143 and 144.) This testimony of the plaintiff's witness was corroborated by the defendant's witnesses. (Record, Page 268.)

On the 11th of November, just three days prior to the date of explosion, this crown sheet was thoroughly inspected by an inspector of the defendant company, as required by the Federal Boiler Act, and was found to be in perfect condition. The engine from that time until the date of the explosion was alone operated by the plaintiff's intestate, and if he performed his duty, under the rules of the Company, he inspected the crown sheet at the commencement and end of each run. He was required to make written reports at

the end of each run showing the condition of his engine. The written reports made by him at the end of the last two runs were offered in evidence, and did not show that there was anything wrong with the crown sheet. The counsel for the plaintiff in their brief seek to draw an inference unfavorable to the defendant from the fact that the written reports for the last two runs only, were filed, and that the written report for the previous run was not produced and filed. It is gravely argued that from the failure to file this previous report that an inference may be drawn that there was some defect in the crown sheet reported. The utter lack of foundation for such an inference is the fact that the last two reports failed to show any defective condition of the crown sheet, because if a defective condition was reported at the end of the previous trip, and had not been repaired, it would have clearly been the duty of the plaintiff's intestate, under the rules, to continue to report this defective condition at the end of each trip, so long as such defect existed. When the plaintiff's intestate arrived at Roanoke on the morning of the 14th day of November, the date of the accident, if he performed his duty, and in the absence of evidence to the contrary, we must presume that he did, he inspected the crown sheet, and did not report that it was defective on account of being burned. The hostler who took charge of the engine on its arrival that morning also inspected the crown sheet and did not discover that it had been burned. (Record, Page 230.) The hostler who delivered the engine to Andrews on the evening of the 14th of November, when he started on the trip, during which the explosion occurred, inspected the crown sheet, and found that it had not been burned up to that time. (Record, Page 237.) After taking charge of the engine that even ng the plaintiff's intestate is shown to have performed his duty by making an inspection of the crown sheet before leaving Roanoke, and as he said nothing about the crown sheet having been burned, and started on the trip with the engine, we must presume that the crown sheet up to that time had not been burned.

There is absolutely no escape from the conclusion that the crown sheet of the engine had not been burned up to the time of the commencement of the trip on which the explosion occurred. As already stated, it is an admitted fact in the case that the crown sheet had been burned at some time prior to the explosion. The inevitable result, therefore, is that the crown sheet was burned at some time between the commencement of that trip and the happening of the accident.

(6) The way the bolt heads were broken down into the heads shows that the crown sheet and bolt heads were overheated, or burned, at the time of failure.

A number of bolt heads, as already stated, were found in the fire box of the engine after the explosion. These bolt heads were so broken that there were large concave cavities down in the heads. In other words, the bolt heads, in separating from the bolts, had not broken straight across where they rested against the crown sheet, but the breaks were irregular, the fracture of the material having occurred down in the heads. It is a fact of common knowledge and is shown by the uncontradicted evidence in the case that if the bolt heads had not been over-heated at the time of failure the fracture would have been straight across the bolts at the point where the heads rested against the crown sheet, and that the fracture would not have been irregular, extending down into the heads. The reason that the bolt heads broke in this way is due to the fact that when they became over-heated on account of low water, as explained by the witnesses, the material near the surface of the heads and nearest the fire became heated to the point of failure. The plaintiff's expert witness, Randolph, admits that the way the bolt heads were broken down into the heads and the color of the heads show that they were hot; that is, overheated from an absence of water on the crown sheet when they failed. (Record, Pages 532, 533 and 536.) This admission of the witness is in direct conflict with his statement to the effect that the color of the crown sheet indicates that

it had water on it at the time of failure. This admission, based on a physical fact which cannot be otherwise explained, must be more controlling than an opinion based alone on the color of the sheet, which may vary according to conditions—as shown by the testimony of the witness, Scrivenor. The color of a burned crown sheet will change as a result of lapse of time, and other conditions as shown by the testimony introduced by the defendant. (Record, Page 393.)

(7) The contour of that portion of the surface of the bolt heads resting against the crown sheet and the impression made on the crown sheet around the bolt holes showed that the burning of the crown sheet occurred at the time of failure.

The convex appearance of that portion of the bolt heads resting against and supporting the crown sheet which were found in the fire box after the explosion has already been described. The crown sheet around the bolt holes where the bolt heads rested against and supported the crown sheet showed distinct impressions which the bolt heads had made on the crown sheet in their tendency to pull through the sheet. The defendant's witnesses testified that the bolt heads could not have been forced in this shape, and that these impressions could not have been made by the bolt heads on the crown sheet unless the failure was caused by the crown sheet being burned. In other words, that if the failure had been caused from a weak or defective condition of the stay bolts, and the failure had occurred when the crown sheet and stay bolt heads were cold that the stay bolt heads could not have been forced in this shape, and that these impressions could not have been made by the stay bolt heads on the crown sheet. The plaintiff's witness, Randolph, says that when the stay bolts are in good condition and they are subjected to a sufficient strain to break them that this leaves a characteristic appearance on the crown sheet as a result, which appearance he found present on this crown sheet. (Record, Pages 125 and 126.) This shows that the stay bolts were of sufficient strength, and

that they could have only been broken in the way that they were by being over-heated at the time of failure.

As opposed to all of these unanswerable reasons that the crown sheet failed from being over-heated at the time of failure, we have only the theory of the plaintiff's witness, Randolph, that the color of the crown sheet indicates that it had water on it at the time of failure. The color of the crown sheet, as already shown, is an indication of uncertain value, and may vary according to conditions. In addition to this, the testimony of a number of witnesses of practical experience introduced by the defendant was to the effect that the color of the crown sheet, introduced in evidence, indicated beyond question that the crown sheet had been burned at the time of failure. However this may be, the foregoing facts which are established by the testimony of the witnesses for both the plaintiff and defendant show that the burning of the crown sheet necessarily occurred on that trip.

The inspections of the crown sheets, already referred to in detail, and the failure to discover either the bagging between the stay bolt holes or the leakage which would have been caused by the bagging, demonstrate that the crown sheet was not in that condition when the plaintiff's intestate took charge of the engine at the commencement of that trip. If the crown sheet was burned on that trip, it only remains to determine as to whether or not the defendant can be held responsible for the accident on account of a defective condition of the water glass gauge. The plaintiff seeks to establish a defective condition of the water glass gauge by the testimony of Jerry Walton that he observed the water in the water glass gauge, and that the right injector was supplying water to the boiler. His testimony may be said to establish, when viewed as on a demurrer to the evidence, that the water glass gauge showed water in the boiler when the train left Roanoke, and from that point to the Norfolk & Western bridge. It also indicated water in the boiler at Singer tank. He did not observe the water glass gauge from the Norfolk &

Western bridge to Singer tank, a distance of several miles, but not shown accurately by the record, and between Singer tank and the point of accident, about two and one-half miles. The testimony shows that if the injector was not properly working that the quantity of water in the boiler at Singer tank, as testified to by Jerry Walton, might be exhausted and the crown sheet uncovered at a point a considerable distance east of the point where the explosion occurred. (Record, Pages 277, 290.) The opinion evidence of this witness as to the operation of the injector and as to whether or not it was supplying water to the boiler was rejected by the decision of the Supreme Court of Appeals of Virginia, and properly so in view of his admitted unfamiliarity with engines and injectors of this class.

The plaintiff's witness, Richardson, testified that a person had to be familiar with this type of engine and injector to be able to tell from the sound that the injector was working properly (Record, Page 75), and the effect of the testimony of the plaintiff's witness, Randolph, is that with the window closed it is difficult to tell whether the injector is working properly or not. (Record, Page 118.) The window was closed on this trip at the time of the accident. (Record, Page 261.) That there was no defect in the injector was conclusively shown by the evidence, and was an admitted fact in the case.

There is absolutely no evidence tending to show that the water glass gauge was defective or failed to properly register the water in the boiler except the testimony of Jerry Walton before referred to. The water glass gauge was in proper condition when the engine arrived in Roanoke on the morning of the accident, as shown by the written report of the plaintiff's intestate, and by the testimony of the hostler to whom he delivered the engine upon arrival. (Record, Pages 227, 228 and 229.) It was in a proper condition when the engine was delivered to the plaintiff's intestate at the commencement of the run on which the explosion occurred, as shown by the testimony of the hostler who delivered the

engine to the plaintiff's intestate. (Record, Page 236.) It must be presumed that the plaintiff's intestate performed his duty by inspecting the water glass gauge before starting on the run and found it to be in satisfactory condition; otherwise, he would not have relied on it. After the accident, the water glass gauge was inspected by two inspectors sent out by the Interstate Commerce Commission, as well as by a number of other people, and found to be in a perfect condition. (Record, Pages 415, 430.) These inspections demonstrate that there was no defect in the water glass gauge. This engine, as well as all other locomotive engines, was provided with gauge cocks for the purpose of determining the quantity of water in the boiler. The uncontradicted testimony of several witnesses is to the effect that the gauge cocks afford a more certain and reliable means of determining the quantity of water in the boiler than the water glass gauge. (Record, Pages 274, 291, 292.) It is also shown by the evidence not controverted that the movement of the water in the water glass gauge shows whether or not the water glass gauge is properly performing its function; that if the water glass gets stopped up, the sluggish movement of the water in the water glass gauge will show that it is not properly performing its function. (Record, Pages 274, 292.) If the water glass gauge is not working properly the engineer would know it. (Record, Pages 274, 292.) When the engineer finds that his water glass gauge is not working properly he can blow it out, or rely on the gauge cocks to indicate the quantity of water in the boiler (Record, Pages 274, 292). It is a fair inference from the testimony (Record, Pages 274, 292), that the openings leading into the water glass gauge may and do sometimes become stopped up while an engine is being operated. It is a fact of common knowledge that the water used in locomotive boilers is not free from sediment and other foreign matter, which may at any time stop up the openings to a water glass gauge. If the water glass gauge became stopped up on the trip on which the explosion occurred, it was the duty of the plaintiff's intestate to know that fact

and remove the obstruction or rely on the gauge cocks. If the water glass gauge was working properly at the commencement of the trip as demonstrated by the uncontradicted evidence above referred to, and the plaintiff's intestate allowed it to become stopped up, and relied on it in that condition, then his negligence was solely responsible for the accident, and there can be no recovery in this case.

After the explosion and as soon as it could possibly be done, the engine and boiler were carefully inspected by two boiler inspectors of the Interstate Commerce Commission in the exercise of their official duty for the purpose of making a report to the Commission, and was also inspected by the Chief Boiler Maker of the N. & W. Ry. Co., a disinterested party. (Record, Page 335.) The boiler was not only inspected by these disinterested parties, but the appurtenances thereto, such as water glass gauge, the injectors, the steam gauge, etc., were subjected to tests to determine their condition. These inspections and tests were made while the evidences of the cause of the explosion were fresh, and while the persons making the inspections had before them the entire boiler and its appurtenances and the effects of the explosion on the different parts of the boiler could then be observed in relation to each other. The plaintiff's witnesses never saw the entire boiler; in fact, the witness, Randolph (Record, Page 114), admits to the jury that he had not before him sufficient evidence to check his opinion. This witness did not see the portion of the crown sheet that was cut away from the rest of the boiler and brought into court until the first trial of the case in the Federal Court at Roanoke. (Record, Pages 127 and 151.)

The plaintiff's witness, Scrivenor, did not see any part of the exploded boiler until he testified in the case at Christiansburg on October 6th, 1914, nearly two years after the accident. (Record, Page 112.) Furthermore, the witnesses who examined the boiler immediately after the accident were, as already shown, practical men accustomed to dealing with such matters in their everyday work, and examined it

for the purpose of ascertaining what the real cause of the explosion was, and were, consequently, without prejudice. On the other hand, one of the plaintiff's witnesses had been without any practical experience for a period of twenty-one years and the other had had no practical experience, and the examinations they made were for the purpose of giving expert testimony on behalf of the plaintiff. The result of these impartial examinations made directly after the accident was that all of these experienced men were of the opinion that the explosion was undoubtedly caused by low water in the boiler at the time of the explosion. (Record, Page 413, 428 and 440.)

From this review of the evidence, it is clear that the breaking of the stay bolts which caused the accident was not due to any defect which existed at the time the plaintiff's intestate took charge of the engine, and that the explosion was caused by the stay bolts being over-heated and weakened through the negligence of the plaintiff's intestate at some time after the commencement of that trip. It is also clear that there was no defect in the water glass gauge at the commencement of this trip, and that if it became stopped up or out of order on this trip, it was the duty of the plaintiff's intestate to know that it was out of order and correct the trouble, or else not rely on it.

## CONCLUSION.

It is, therefore, respectfully maintained that upon an examination of the evidence in this case, there is not only a failure to disclose that the findings of fact by the State Courts is palpably erroneous, but, on the contrary, such an examination of the evidence demonstrates that the facts and inferences resulting therefrom, as found by the State

Courts, are fully supported, and we might say fully demonstrated by the evidence.

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